

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MULTI-COLOR CORPORATION
Petitioner

v.

BROOK & WHITTLE LIMITED
Patent Owner

PGR2025-00025
Patent No. 11,961,422

DECLARATION OF DR. SCOTT PHILLIPS

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All emphasis added unless otherwise noted

I, Scott Phillips, declare as follows:

I. INTRODUCTION

1. My name is Scott Phillips. I have been retained as an independent expert witness by Brook & Whittle Limited (“Patent Owner”) in connection with the above-captioned petition for post grant review, PGR2025-00025. I understand that this proceeding involves United States Patent No. 11,961,422, entitled “Recyclable Heat Shrink Film For Recyclable Container.” EX1001. I understand that the ’422 patent issued from U.S. Patent Application No. 18/103,234 (the “’234 Application”), filed on January 30, 2023. EX1001 at Cover. The ’234 Application is a continuation of Application No. PCT/US2022/029280, which was filed on May 13, 2022, and claims priority to Provisional Application No. 63/188,794, filed on May 14, 2021. EX1001 at Cover.

2. I have been asked to prepare this Declaration to provide my opinions regarding the patentability of the claims in the ’422 patent. I am being reimbursed at my standard hourly consulting rate of **\$350** and separately for any out-of-pocket expenses. My compensation is not affected by nor dependent in any way on the outcome of this matter.

3. In forming the opinions expressed in my Declaration, I relied upon my education and experience, as described in Section II and in my

curriculum vitae attached hereto as **Appendix A**. I considered the viewpoint of a person having ordinary skill the art (“POSITA”), as discussed in Section VI below, as of the respective priority date of the ’422 Patent.

4. I have reviewed and am familiar with the specification of the ’422 Patent. EX1001. I have further reviewed, and am familiar with, the following materials from the record of the present proceeding:

Exhibit & Paper No.	Description
1001	U.S. Patent No. 11,961,422
1002	Filing History of U.S. Patent No. 11,961,422
1003	Petitioner Gatorade Label
1004	Petitioner Febreze Label
1005	PET-CG-02 Critical Guidance Protocol (Non-Operative Version)
1006	PET-P-00 PET-CG-02 Critical Guidance Protocol
1007	PET-S-04-PET Package Materials Balance Test
1008	PET-S-01 PET Label Wash Water Test
1009	RES-LBL-2 APR Shrink Sleeve Labels Resource Document
1010	APR NIR Sort Protocol Evaluation
1011	SORT-B-03 APR Metal Sort Protocol Evaluation
1012	RD-TM-210-4 Caustic Evaluation PET SSL
1013	Bushman Declaration
1014	Deible Declaration
1015	ATSM D2732
1016	EL62 PET Film
1017	Andy Sharp, <i>Why You Should Switch to Light-Blocking Shrink Sleeves</i>
1018	APR Letter to Dr. Henderson
1019	ChemSHIELD Silver Ink Data Sheet
1020	U.S. Patent. Pub. No. US 2017/0223879 A1
1021	Second Declaration of Mr. Craig Bushman
1022	BW Litigation Defendant’s Motion to Stay
1023	BW Litigation Nestle Motion to Dismiss
1024	BW Litigation Fuji Motion to Dismiss

Exhibit & Paper No.	Description
1025	BW Litigation Complaint
1026	Prosecution History of the '677 Application
1027	PET-CG-02 Critical Guidance Protocol (Operative Version)
1028	PET-P-00 PET-CG-02 Critical Guidance Protocol (Operative Version)
1029	PET-S-04-PET Package Materials Balance Test (Operative Version)
1030	PET-S-01 PET Label Wash Water Test (Operative Version)
1031	GEN-TM-7A-B Caustic Evaluation PET SSL
1032	Supplemental Declaration of Dr. Michael Deible
1038	May 1, 2019 Summation Report for Critical Guidance Recognition
1044	APR caustic wash test data relating to the Gatorade label
1045	Email and attached curriculum vitae of Dr. Michael Deible
2001	"Going for Gold," Multi-Color Corporation
2002	"NESCAFE® Debuts Gold Espresso and Ice Roast Instant Coffee in the U.S., Offering Rich Variety for Every Occasion"
2003	recycLABEL™ Shrink Sleeve Brochure, Multi-Color Corporation
2004	"Labeled with Care – Sustainability Update," Multi-Color Corporation
2005	"Nestlé to use recyclable, light-blocking shrink sleeves on some beverage products," Packaging Dive
2006	Civil Docket
2007	Docket Control Order
2008	Fuji's Motion for Leave to Supplement Invalidity Contentions
2009	Order Granting Fuji's Motion for Leave to Supplement Invalidity Contentions
2010	Deposition Transcript of Mr. Craig Bushman
2011	Deposition Transcript of Dr. Michael Deible
2012	Declaration of Dr. Maureen Reitman
2013	Declaration of Dr. Scott Phillips
2014	"Gatorade and Cheetos are Among the Pepsi Products Getting a Natural Dye Makeover," NY Post
2015	"Can I Drink Gatorade Past the Best Before Date on the Bottle," PepsiCo
2016	US Patent Application No. 2025/0273094
2017	"Nesquik Makes Bottles Easier to Recycle for Consumers," Nestle
2018	Email from A. Leonard (Nestle) to S. Figueroa (B+W)
2019	PACKAGING EUROPE, <i>Winners of the Sustainability Awards 2024</i>

Exhibit & Paper No.	Description
	<i>Announced!</i> , (Nov. 14, 2024).
2020	PACKAGING EUROPE, <i>Sustainability Awards 2024 Finalist Interview: Brook+Whittle's Recyclable, Light-Blocking Shrink Sleeve</i> , (Sept. 24, 2024).
2021	<i>AWA Sleeve Label Awards 2024 - Winners</i> (October 28, 2024)
2022	US Plastics Pact 2023 LinkedIn Post
2023	US Plastics Pact 2024 LinkedIn Post
2024	<i>Brook + Whittle LTD v. Nestle USA, Inc. et al.</i> , 2:24-cv-00735-JRG-RSP, Dkt. 1 (Complaint)
2025	<i>Brook + Whittle LTD v. Nestle USA, Inc. et al.</i> , 2:24-cv-00735-JRG-RSP, Dkt. 1, Ex B (Claim Chart)
2026	PET-S-09, Evaluation of PET Plaques for Color, Haze and Inclusions
2027	US Patent Application No. 18/667,677 September 3 Remarks
2028	US Patent Application No. 18/667,677 October 24 Final Rejection
2029	"Heat Treatment Impacts on Film Morphology in Biaxially Oriented Polypropylene Films," Kivilcim, Fadime Nulufer, <i>Food Sci. & Nut.</i>
2030	"The Amazing Shrink Inks," Packaging Impressions
2031	"Wrinkling-to-delamination Transition in Thin Polymer Films on Compliant Substrates," Nolte, Adam J., <i>Soft Matter</i> , 2017
2032	"Review Article: Stress in Thin Films and Coatings: Current Status, Challenges, and Prospects," Abadias, Gregory, <i>J. Vac. Sci. Technol.</i> 2018
2033	"Product Decoration Technologies: Sleeving," Finishing & Embellishment
2034	"Brook + Whittle's GreenLabel BlockOut Receives Important Recyclability Recognition and Prequalification," Brook + Whittle
2035	"MCC Receives APR Recognition for recycLabel Roll-Fed Label on PET Bottles," MultiColor Corp
2036	"Trap (printing)," Grokipedia
2037	<i>Brook + Whittle LTD v. Nestle USA, Inc. et al.</i> , 2:24-cv-00735-JRG-RSP, Dkt. 112, Claim Construction Order
2038	Plastics Forming Enterprises LLC, Laboratory Report #2467 APR PET Benchmark
3001	Attorney Correspondence
3002	U.S. Patent. Pub. No. (Mitchell)
Paper 2	Petition
Paper 7	Patent Owner's Request for Discretionary Denial

Exhibit & Paper No.	Description
Paper 8	Patent Owner's Preliminary Response
Paper 9	Petitioner's Opposition to Discretionary Denial
Paper 12	Petitioner's Reply to Patent Owner's Preliminary Response
Paper 13	Patent Owner's Sur-Reply
Paper 14	Decision Granting Institution of Post-Grant Review
Paper 15	Scheduling Order
Paper 16	Patent Owner's Objections to Evidence
Paper 17	Petitioner's Motion to Submit Supplemental Information
Paper 18	Patent Owner's Opposition to Petitioner's Motion to Submit Supplemental Information
Paper 24	Petitioner Transmittal Letter for EX1038

5. My analysis of the materials relating to this matter is ongoing and I will continue to review any new material as it is provided. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials.

II. QUALIFICATIONS AND BACKGROUND

6. My educational background, career history, publications, patents, and other relevant qualifications provided here are only a summary. I have extensive experience in the fields of materials science and engineering. Attached as Appendix A is a copy of my current CV, including a list of selected publications. A list of my patents, litigation expert witness experience, and consulting contracts is attached as Appendix B to this Declaration.

7. In 1999, I received my Bachelor of Science (“B.S.”) degree in Chemistry from California State University, San Bernardino. In 2004, I received my Doctor of Philosophy (Ph.D.) in Organic Chemistry from the University of California, Berkeley.

8. After I graduated with my Ph.D., I was a Postdoctoral Fellow in organic chemistry at Harvard University from 2004 to 2006, after which I was a Research Fellow in analytical and materials chemistry from 2006 to 2008, also at Harvard University. I was a Professor in the Department of Chemistry at The Pennsylvania State University from 2008 to 2017, being promoted to Full Professor in 2017. In 2017, I moved to the Micron School of Materials Science & Engineering at Boise State University as Full Professor, which is my current position.

9. I have received various honors and awards for my work. Select examples include the Camille & Henry Dreyfus New Faculty Award; the Beckman Foundation Young Investigator Award; the DARPA Young Faculty Award; a Gates Foundation Grand Challenge Explorations Award; the Popular Mechanics Breakthrough Award; the 3M Non-Tenured Faculty Award; the NSF CAREER Award; the Alfred P. Sloan Research Fellowship; the Eli Lilly and Company Young Investigator Award; the Arthur F. Findeis Award; Emerging Investigator awards from *Chemical Communications*,

Polymer Chemistry, and Analytical Methods; and the MSMLG Czarnik Emerging Investigator Award.

10. I have authored 18 patents and patent applications, and am an author or co-author on more than 78 publications and three book chapters. An abbreviated list of my publications is contained in my *curriculum vitae*, attached heretofore as Appendix A. A comprehensive list of my patents is contained in Appendix B to this Declaration.

11. In addition to my work in academia, I have experience working in the recycled plastics and plastic films industry, including developing new types of pressure-sensitive adhesives for recyclable labels in collaboration with Avery Dennison Corporation from 2018 to present. Much of this work specifically focuses on meeting APR guidelines for pressure-sensitive adhesive labels, including the APR guidelines for caustic washes in bottle and label recycling processes. From 2022 to 2025, I was the founder and owner of Remix Materials, which was a company that aimed to convert mixed, hard-to-recycle plastic waste into lumber and ultimately into robust benches, planters, and related products. Our work focused on repurposing plastics that do not meet APR recycling guidelines, and thus are discarded as waste during a recycling process. From 2023 to 2024, I was part owner of Citizen Scientific Workshop, which is a company that manufactures small,

workshop-scale machines and molds for shredding waste plastics, extruding, and injection molding. Since 2022, I am a co-founder and part owner of Fives Designs, which manufactures mosaic tile building toys out of recycled plastic. A primary feature of our products is their ability to be recycled again, following APR guidelines.

III. UNDERSTANDING OF PATENT LAW

12. I am not an attorney. In forming my opinions in this Declaration, I applied relevant legal principles provided to me by counsel. The following represents a summary of my understanding of these issues.

13. I understand that prior art includes patents, printed publications, and in some cases, products publicly sold in the relevant art which predate the filing date of the '422 Patent. I understand that a patent is entitled to claim the benefit of the filing date of its provisional application if the provisional application discloses the subject matter claimed in the patent.

14. I understand that under the *Phillips* claim construction standard used in a PGR, words used in claims are given their plain and ordinary meaning as understood by a person of ordinary skill in the art (“POSITA”). *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc). I understand that a POSITA must interpret the claims in light of the

specification and prosecution history, unless those sources show a clear and unmistakable intent to depart from such meaning.

15. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time of the earliest effective filing date. For purposes of my analysis here, I have followed this approach and applied May 14, 2021, as the earliest effective filing date of all the claims of the '422 Patent that I address in this Declaration.

16. I understand that a claim is unpatentable if it is anticipated. I understand that anticipation of a claim requires that each and every element of a claim be disclosed in a single prior art reference, either expressly or inherently, arranged in the prior art as arranged in the claim.

17. I understand that a claim is unpatentable if it is obvious. I understand that obviousness of a claim requires that the claim be obvious from the perspective of a POSITA at the time of the alleged invention. I understand that a claim may be obvious in view of a single reference, or it may be obvious from a combination of two or more references.

18. I understand that an obviousness analysis requires an understanding of the scope and content of the prior art, any differences

between the alleged invention and the prior art, and the level of ordinary skill in evaluating the art.

19. I understand that to prove that prior art or a combination of prior art renders a patent obvious, it is necessary to (1) identify the particular references that, singly or in combination, make the patent obvious; (2) specifically identify which elements of the patent claim appear in each of the asserted references; (3) explain a motivation, teaching, need or market pressure that would have inspired a person of ordinary skill in the art to combine prior art references to solve a problem; and (4) identify that a POSITA would have had a reasonable expectation of success in combining multiple prior art references or adding missing features.

20. I further understand that certain factors may support or rebut a finding of obviousness. I understand that these factors, sometimes called secondary considerations, may include: (1) commercial success of the alleged invention; (2) skepticism of those of ordinary skill in the art at the time of the alleged invention; (3) unexpected results; (4) long-felt but unsolved need in the art satisfied by the alleged invention; (5) failure of others to make the alleged invention; (6) praise of the alleged invention by those of ordinary skill in the art; and (7) copying of the alleged invention by others in the field. I understand that there also must be a nexus, or

connection, between any such secondary considerations and the claimed subject matter.

21. I understand that a claim is unpatentable if it is indefinite. I understand that a claim is invalid for indefiniteness if, when read in light of the specification and the prosecution history, it fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

22. As part of this inquiry, I have been asked to consider the level of ordinary skill in the field that someone would have had at the time the claimed invention was made. I address the level of ordinary skill in the field of the '422 Patent in Section IV (below).

IV. LEVEL OF ORDINARY SKILL IN THE ART

23. I understand that the teachings of the prior art are viewed through the eyes of a POSITA. My analysis in this declaration is thus based on the perspective of one having the level of knowledge and skill described below as of the earliest effective filing date of the '422 Patent—May 14, 2021.

24. In my opinion, a POSITA at the time of the invention of the '422 Patent is a person with at least a bachelor's degree in one of chemical engineering, chemistry, or polymer chemistry, as well as experience related to packaging films or containers, but different experiences and education

could make up for a deficit in a POSITA's education and experience. Based on the above, I believe I would have met or exceeded these qualifications.

25. For purposes of assessing the level of ordinary skill in the art, I have considered the types of problems encountered in the art, the prior solutions to those problems found in prior art references, the speed with which innovations were made at that time, the sophistication of the technology, and the level of education of active workers in the field. As previously described, I have reviewed and understand the '422 Patent. Based on my above-described experience, I am familiar with and know of the capabilities of a POSITA in this field during the early-2020s.

26. I understand that Dr. Deible opined that a POSITA in the field of the '422 Patent would have had at least a Bachelor's degree in chemistry or a related field, with 5 years of experience in material identification and characterization using multiple analytical methods and field sampling, or equivalent research or professional experience. *See* EX1014 ¶ 24. As explained above, I believe a POSITA would also have possessed experience related to packaging films or containers, which Dr. Deible's definition excludes. Regardless, I possessed at least the qualifications and capabilities Dr. Deible includes in his POSITA definition as of May 14, 2021.

V. PRIORITY DATE

27. For the purposes of forming my opinions in this declaration, I have used the earliest priority date of the '422 Patent, which as explained above is May 14, 2021. EX1001 at 2 (claiming priority to Provisional Application No. 63/188,794).

28. I understand that Petitioner does not contest that the '422 Patent is entitled to the earliest priority date. Pet. at 13-14; EX1014 ¶ 23. However, Petitioner and Dr. Deible incorrectly state that the '422 Patent's earliest priority date is May 13, 2022. Pet. at 13-14; EX1014 ¶ 23. Petitioner appears to state that the May 13, 2022 date is derived from the fact that the '422 Patent claims priority to the earlier filed application 2022/029280. Pet. at 13-14; EX1014 ¶ 23; EX1001 at Cover. Petitioner fails to acknowledge that the 2022/029280 application further claims priority to the Provisional Application No. 63/188,794, which was filed on May 14, 2021. EX1001 at 2. Therefore, the earliest priority date available to the '422 Patent is May 14, 2021, and I have used this date in my analysis. I note, however, that my opinions would remain the same even if the priority date was found to be May 13, 2022.

VI. BACKGROUND

A. Technology Overview and the '422 Patent

29. The '422 Patent is directed to a recyclable shrink label with a light blocking layer to block at least 80% of incident light with wavelengths between 200 nm and 900 nm in which the label is recyclable along with a container. EX1001 at Abstract. The '422 Patent recognizes that “[t]he dairy, food, nutraceutical, and other markets also require light protective packaging to block ingredient harmful light waves from impacting the shelf life and performance of those products.” EX1001 at 1:16-20. Moreover, according to the '422 Patent, “[t]he consumer packaged-goods markets globally aspire to utilize recyclable packaging for most products.” EX1001 at 1:14-15. While “[c]lear PET packaging provides a cost effective recyclable option,” “[t]raditionally, color impregnated bottles or containers, and/or white shrink films printed with or sometimes without functional light blocking layers are used to block the harmful light waves.” EX1001 at 1:15-23. Color impregnated bottles or containers are not readily recyclable, however. EX1001 at 1:23-25. Therefore, the '422 Patent recognizes “there remains a need for recyclable, light protective packaging options for many markets, including the food and nutraceutical markets.” EX1001 at 1:26-28.

30. The '422 Patent accordingly discloses a variety of exemplary embodiments aimed at providing a recyclable, light blocking, heat shrink label that can be embellished with various layers, such as an indicia layer to convey a message (e.g., characteristics of a product in a package, the quantity of a product in a package, or other messages), and a high opacity layer to block light from interacting with the contents of the container. EX1001 at 1:36-3:3, 5:4-42, Figs. 1A-1E, 2; *see also id.* at 5:12-15 (“Opacity can be measured as described in ASTM D 589-97, Standard Test Method for Opacity of Paper (15°/Diffuse Illuminant A, 89% Reflectance Backing and Paper Backing”). The labels claimed by the '422 Patent “serve to block light from reaching a product inside the package.” EX1001 at 6:23-29, Fig. 2.

31. The '422 Patent describes the various layers comprising a heat shrink, light blocking label. For example, the heat shrink label can be composed of a polyester heat shrink film as is used in the packaging industry. EX1001 at 7:38-43. When heated, the shrink label can shrink anywhere from 1% up to 50% or more in order for the label to conform to the container. EX1001 at 8:15-37. The heat shrink film can have layers added to it that may contain pigments, fillers, stabilizers, light protective agents, or other suitable modifying agents. EX1001 at 9:50-53. Shrinkage

is “typically measured using a hot water bath method, where the film is immersed in a heated water bath for 10 seconds. The measurement may be repeated at different temperatures, such as at 100° C. and 80° C. Shrinkage may be reported at a given temperature, or shown as a shrink curve.” EX1001 at 8:19-24.

32. The '422 Patent also describes multiple layers that can be added to the heat shrink film. For example, a high opacity layer can be added, which may be useful to add to a clear shrink film. EX1001 at 11:55-64. High opacity layers may contain white pigments such as titanium dioxide. EX1001 at 11:65-12:5. “The desired [high opacity] dry coat weight may range from 0.5 ppr to 25 ppr.” EX1001 at 13:4-5; *see also id.* at 5:43-46 (“[T]he term ‘ppr’ refers to pounds per ream and is used as the unit of measurement of dry pounds of ink or coating per area of substrate (e.g., film or label). One ream is understood to mean 3000 sq ft (about 289 m²).”

33. In addition to the high opacity layer, the '422 Patent also describes the use of a light blocking layer to prevent light from interacting with the contents of the container. The light blocking layer described by the '422 Patent may include one or more light blocking components, including one or more metals such as aluminum. EX1001 at 13:48-63. The light blocking component can be a particulate material, characterized by a particle

size diameter of between 0.1 μm to 100 μm . EX1001 at 13:64-14:8. Particle size is the “average particle size diameter measured by laser diffraction.” EX1001 at 14:8-10. The ’422 Patent discloses using a “UV-Vis spectrophotometer, such as the Shimadzu model UV-2600i[,]” to measure “the amount of light blocked by the label[.]” EX1001 at 13:45-47.

34. In addition, heat shrink labels claimed by the ’422 Patent can also include an indicia layer applied to the shrink film to form a graphics layer, including printed messages and/or pictorial designs. EX1001 at 15:54-59, 16:49-53.

35. The labels claimed by the ’422 Patent are applied to an article (e.g., a bottle or other container). EX1001 at 17:24-26. Figures 1A-1E of the ’422 Patent illustrate various embodiments in which the layers of the heat shrink label can be employed in different configurations depending on the desired characteristics. For example, in Figure 1A, the heat shrink label includes a heat shrink film 120, upon which indicia layer 125 (e.g., graphics) is disposed on one surface thereof and an opposing surface includes a high opacity layer 110 and a light blocking layer 115 on the high opacity layer 110, such that the light blocking layer 115 is the closest to the article that the heat shrink label 100 is applied to. EX1001 at 17:24-32.

36. In other embodiments, the layers can be applied in different orders, depending on the needs of the label. Figures 1B-1E depict alternative embodiments where the various layers are applied in alternative orders.

37. An important aspect of the '422 Patent is that the claimed labels are recyclable along with the containers to which the label is fixed. For example, in some embodiments, the article or container may be made of the same or similar polymer as the label (e.g., PET) such that both the container and label can be recycled together. EX1001 at 18:25-30. The '422 Patent explains what is meant by the claimed “shrink label is recyclable with a PET container.” EX1001 at cl. 1. For example, the Abstract for the '422 Patent states “Articles including the recyclable shrink label may be recycled in a process where both the container and the label are recognized as a resin and may be directed into a corresponding recycling stream. In some cases, both the container and the label include PET.” EX1001 at Abstract. Recyclable labels, according to the specification include inks that wash off the substrate such that the underlying resin can be reclaimed. EX1001 at 20:16-20. The '422 Patent also discloses that the labels “can meet certain industry standards” published by the Association for Plastic Recyclers (“APR”). EX1001 at 11:32-38. These industry standards present exemplary testing

methods for assessing different aspects of the recycling process, including by using a “caustic wash.” EX1001 at 11:45-49; *see also* EX1001 at 6:58-65.

B. The ’422 Patent Prosecution History

38. The ’422 Patent issued from U.S. Patent Application No. 18/103,234 (the “’234 Application”), filed on January 30, 2023. EX1001 at Cover. The ’234 Application is a continuation of Application No. PCT/US2022/029280, which was filed on May 13, 2022, and claims priority to Provisional Application No. 63/188,794, filed on May 14, 2021. EX1001 at Cover. The ’234 Application was originally filed with 4 independent claims—claim 1 reciting a “recyclable shrink label,” claim 16 reciting “[a]n article” comprising a container and shrink label, claim 20 reciting “[a] method of making a label for a container,” and claim 21 reciting “[a] method of recycling an article.” EX1002 at 11-13. Concurrently with the initial application, Applicant submitted an Information Disclosure Statement (“IDS”) listing several guidance documents from the Association of Plastic Recyclers (“APR”) including: Shrink Sleeve Labels on PET Containers APR Resource Document (1/4/2021) (the “APR Resource Document”); Critical Guidance Protocol for Clear PET Articles with Labels and Closures (8/17/2021) (the “APR Critical Guidance Protocol”); Evaluation of the Near

Infrared (NIR) Sorting Potential of a Whole Plastic Article (5/15/2018) (“SORT-B-01”); and Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized, or Metallic Printed Components (5/15/2018) (“SORT-B-03”) (collectively, “APR Guidance Documents”). EX1002 at 92-93. On June 8, 2023, the Examiner issued a Requirement for Restriction/Election, requiring Applicant to restrict the application to one of the following inventions: (1) claims 1-19, drawn to a recyclable shrink label, or (2) claims 20-21, drawn to a method of making a label for a container. EX1002 at 207. Applicant elected Group 1 (claims 1-19), drawn to a recyclable shrink label (and article comprising the recyclable shrink label). EX1002 at 213.

39. On August 9, 2023, the Examiner rejected the elected claims under 35 U.S.C. § 112(b), as well as under § 103 over various prior art references, including U.S. Patent Application Publication 2017/0223879 (“Mitchell”). EX1002 at 224-228. Among other reasons, the Examiner noted that Mitchell teaches an “electromagnetic radiation blocking label arrangement and a container comprising the radiation blocking label arrangement thereon.” EX1002 at 228. The Examiner also noted that the “term ‘recyclable’ is considered functional language related to the intended use of the product and is accorded limited weight as the language does not

further limit the structure.” EX1002 at 229. In light of this, the Examiner explained that Mitchell “teaches all the structural features of claim 1” and “would be capable of performing in the manner claimed” because it “teaches that the shrinkable labels provide easy separate during recycling processes.” EX1002 at 229. The Examiner also signed the January 30, 2023 IDS listing the APR Guidance Documents and noted that “ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH.” EX1002 at 218-219. None of the APR Guidance Documents were lined through. EX1002 at 218-219.

40. On October 16, 2023, Applicant amended both pending independent claims to add the limitations requiring “a heat shrink film comprising polyethylene terephthalate (PET)” and “wherein the recyclable shrink label is recyclable with a PET container.” EX1002 at 316. Applicant also amended several claims to remove certain limitations in order to traverse § 112 rejections. EX1002 at 333-34.

41. In making its amendments to overcome the Examiner’s rejections, Applicant explained that it disagreed with Examiner’s assertion that “[t]he term recyclable is considered functional language related to the intended use of the product and is accorded limited weight as **the language does not further limit the structure** or the process.” EX1002 at 335

(internal quotes omitted) (emphasis in original). As Applicant explained, “[t]he term ‘recyclable’ does further limit the claim in that the claimed label **must be capable of being recycled**” and cautioning that “[n]ot all combinations of shrink films and light blocking materials are capable of being recycled.” EX1002 at 335 (emphasis in original). Applicant further explained: “It should also be noted that removing the label before or during the recycling process is not evidence of the recyclability of the label.” EX1002 at 335.

42. Thus, Applicant distinguished the claimed invention over the Mitchell reference, which teaches an entirely non-PET label and which states “it would be desirable that the labels are **removable** from the surface of the container but also **separable** in the normal sink-float washing process thus *promoting recycling of the container*.” EX1002 at 335 (emphasis in original). In contrast to Mitchell, Applicant states that “removing the label before or during the recycling process is not evidence of the recyclability of the label” and “[i]f anything, the desire to provide a removable label implies that the label may not be recyclable and must be removed before the container itself can be recycled.” EX1002 at 335. According to the Applicant, “[r]emoving the label during the recycling process is not equivalent to actually recycling the label.” EX1002 at 335.

43. On November 13, 2023, the Examiner issued a final rejection of the pending independent claims under §§ 102 and 103 over Japanese Patent No. 2009-214535A (“Sasaki”). Critically, the Examiner noted in her response to Applicant’s amendments that “Applicant’s arguments with respect to claims 1-4, 6-16 and 23-26 have been considered but are moot because the new ground of rejection does not rely on any reference applied in the prior rejection of record for any teaching or matter specifically challenged in the argument.” EX1002 at 357.

44. On January 10, 2024, Applicant further amended the claims to include the limitation “wherein the light blocking component comprises a particulate having a particle size of 0.1 μm to 100 μm , wherein the particulate comprises metal, metal oxide, a reflective pigment, carbon black, mica, or a combination thereof.” EX1002 at 409. According to Applicant, the claim amendment included the subject matter of claim 12, which is not rejected under § 102 over Sasaki and is therefore patentable. EX1002 at 417.

45. On February 6, 2024, the Examiner issued a Notice of Allowance for all claims, noting that Applicant’s arguments have been fully considered and are persuasive. EX1002 at 435. The ’422 Patent accordingly issued on April 16, 2024. EX1001 at Cover.

VII. CLAIM CONSTRUCTION

46. I understand that there is a dispute as to the meaning of the claim term “recyclable.” I understand that Patent Owner has submitted a proposed claim construction for the term “recyclable.” That proposed construction is “capable of being recycled without removing the label from a container before or during the recycling process.” Paper 8 at 12. I understand that Petitioner has not offered a proposed construction. As such, Petitioner, Dr. Deible, and Mr. Bushman contend that the terms of the patent are understood “in accordance with the ordinary and customary meaning of such claim as understood by a person of ordinary skill in the art.” EX1013 ¶ 21; EX1014 ¶ 21.

47. I further understand that Patent Owner’s proposed construction is consistent with the construction applied in the related Eastern District of Texas litigation. EX2037.

48. I understand that the Board, in instituting PGR, offered a preliminary construction of the word “recyclable.” *See* Paper 14. I understand that the Board noted that “a label is not recyclable ... if: (1) the label must be removed...for the PET container to be recycled ... or (2) the label contains inks or pigments that could not be removed during recycling” and so “would contaminate the PET polymer flake....” Paper 14 at 11. I

also understand that the Board further noted that it is “still necessary to determine when a label is recyclable.” Paper 14 at 12. The Board recited several “descriptions or standards” from the ’422 Patent and concluded that “any of these standards can be used to determine if a shrink label is ‘recyclable’” and that “[i]t is unclear at this stage of the proceeding whether these standards are consistent with each other.” Paper 14 at 12, 24. I understand that the Board’s construction was preliminary and invited additional briefing on this issue. Paper 14 at 13.

49. Based on my review of the record, including the file history, the Board’s preliminary construction, and the parties’ briefing, I believe that the prosecution history is consistent with Patent Owner’s proposed construction. Conversely, I do not believe that Petitioner properly accounts for the effect of the prosecution history in determining the scope of the claims as understood by a POSITA. Specifically, Patent Owner noted during prosecution that “removing the label before or during the recycling process is not evidence of the recyclability of the label.” EX1002 at 335. In my opinion, a POSITA would understand this narrowing of the claim scope to inform the meaning of the term “recyclable” in the context of the specification and other aspects of the prosecution history.

50. In my opinion, Patent Owner’s proposed construction is also consistent with the specification. For example, the specification explains in an embodiment that the claimed recyclable labels include inks that wash off such that the underlying polymer resin can be reclaimed in the recycling process. *See, e.g.*, EX1001 at 20:16-20 (“According to an embodiment, during the recycling process, the inks and coating layers cleanly separate from the heat shrink film, allowing pure resin to be recovered and processed into reusable resin.”). Accordingly, it is my opinion that the specification’s description of recyclable confirms that a POSITA would understand the positive meaning of when a label is recyclable under the claims of the ’422 Patent: a label is “capable of being recycled without removing the label from a container before or during the recycling process” when, for example, the label includes inks that wash off the label such that the reusable resin can be reclaimed. *See, e.g.*, EX1001 at 20:16-20.

51. As I explain in Section VII.D below, Patent Owner’s proposed construction is also consistent with the APR Critical Guidance and related guidance documents, which are discussed in an embodiment of the ’422 Patent. *See* EX1001 at 11:29-53. I understand that Petitioner contends that the Gatorade labels are PET. Pet. at 14. To the extent that the labels (and the containers to which they are affixed) are directed to a PET recycling

stream—which is but one embodiment covered by the '422 Patent—the APR Critical Guidance documents explain that labels are recyclable if they can: (1) enter the recycling stream without losing the entire article (label and container) in the recycling process; and (2) if the label can be removed from the recycling stream without staining the remaining flake/wash water, or if the labels stay in the recycling stream and the inks can wash off in a caustic wash. EX1027 at 1 (APR Critical Guidance document stating that it is not appropriate for package constructions that will not pass through sorting steps), 2 (noting “[i]nks and adhesives can impact the costs of managing a wash system and waste disposal.”); EX1030 at 5 (“[a]s a general rule, the recycling industry prefers film labels that float in water and where the ink is retained on the label and does not enter the wash water,” but “[i]n the case of inks that are designed to be removed in the flake wash process, inks that are easier to remove by filtration or settling are more desirable.”).

52. Considering the prosecution history and in view of the specification, “recyclable” in the context of the '422 Patent includes labels that may be recycled without removing the label from a container before or during the recycling process, because they include inks that wash off the substrate such that the underlying reusable resin can be reclaimed along with the container resin.

VIII. OVERVIEW OF PRIOR ART

53. I understand that Petitioner presents four grounds for review in its Petition that rely on three prior art references—the Gatorade label, Febreze label, and Mitchell.

A. Gatorade Label

54. I understand that Petitioner relies on the Gatorade label (EX1003) in Grounds 1, 2, and 3 to argue that the claims of '422 Patent are unpatentable as anticipated or rendered obvious. I understand that Petitioner contends that the Gatorade label “is a shrink sleeve label that is recyclable with a PET container.” Pet. at 6 (citing EX1013 ¶¶ 53-60). I understand that Petitioner claims that the Gatorade label “was produced and sold publicly in 2020, in substantial quantities.” Pet. at 14 (citing EX1013 ¶¶ 54-55). I understand that Petitioner contends that the Gatorade label “includes light blocking features, including ink layers of metal particulates, and including aluminum and titanium dioxide for the silver and white ink” and is recyclable under the APR. Pet. at 14 (citing EX1013 ¶¶ 53, 56-57).

B. Febreze Label

55. I understand that Petitioner relies on the Febreze label (EX1004) in Ground 3 to argue that the Febreze label, in combination with the Gatorade label, render claim 4 of the '422 Patent obvious. I understand

that Petitioner claims that the Febreze label “includes light blocking features, including ink layers of metal particulates.” Pet. at 7 (citing EX1013 ¶ 61). I understand that Petitioner claims that the Febreze label “was produced and sold publicly in 2018, in substantial quantities.” Pet. at 7 (citing EX1013 ¶ 62). I understand that Mr. Bushman contends that the Febreze label “comprises an indicia layer, a high opacity layer, and a light blocking layer” EX1013 ¶ 65. I understand that the Febreze label “is applied to a clear plastic aerosol container” *Id.*

56. Petitioner concedes that the Febreze label was never intended to be recycled. *See* Pet. at 48 (omitting any mention of recyclability from Febreze overview); EX2010 at 110:12-17 (Febreze label “was on a container that was an aerosol can that doesn’t get recycled, so it wasn’t required), 111:7-11 (“Q: And the label itself was not meant to be washed off in a recycling process, correct? A: The aerosol container does not go through the recycling stream.”).

57. I also note that in contrast to the Gatorade label samples cited by Dr. Deible and provided by Petitioner that include an indication of the lot number and year, the Febreze label contains no such indication. Appendix C. Therefore, I am unable to confirm what year the specific Febreze samples provided by Petitioner were made.

C. Mitchell

58. I understand that Mitchell teaches an “electromagnetic radiation blocking label arrangement and a container comprising the radiation blocking label arrangement thereon.” EX1002 at 228. The aims of Mitchell include “provid[ing] a label arrangement suitable for blocking electromagnetic radiation” and “for providing extended shelf life for the product” EX3002 at [0003].

59. I understand that Mitchell alone does not anticipate or render obvious the claims of the '422 Patent, nor does Petitioner argue anything to that effect, in part because Mitchell is not recyclable. *See* Paper 8 at 10. I understand that Petitioner concedes that the Mitchell label is not itself recyclable. *See* EX2011 at 118:14-17 (“Q: Do you have any reason to dispute that the shrink labels taught by Mitchel[l] would not be recyclable with a PET container? A: No.”). Mitchell teaches removing the label from its container before recycling. *See* EX3002 at [0002] (“In an example, it would be desirable that the labels are removable from the surface of the container but also separable in the normal sink-float washing process”); [0003] (“It is also an aim to provide a label arrangement, which is removable from the surface of the item labelled in a subsequent recycling process.”); [0240] (“The item may also be recyclable, such as clear PET bottle. At the

time of recycling the PET bottle, a label attached to the PET bottle, is separated and removed.”). I further understand that the Mitchell reference has already been applied by the examiner and overcome during prosecution of the ’422 Patent. EX1002 at 335-336, 357.

IX. THE CLAIMS OF THE ’422 PATENT ARE PATENTABLE

60. Below I analyze the anticipation and obviousness grounds proposed by Petitioner and determine if the inventions claimed in the ’422 Patent were anticipated by or rendered obvious in light of the prior art to a POSITA at the relevant time.

A. Ground 1: The Gatorade Label Does Not Anticipate Claims 1-3 and 5-19

61. I understand that Petitioner contends that the Gatorade label anticipates claims 1-3 and 5-19. I disagree. In my opinion, the Gatorade label does not disclose every limitation of the ’422 Patent and therefore does not anticipate any claim.

1. *Independent Claim 1*

62. In my opinion, the Gatorade label does not disclose each of the elements of claim 1 and therefore does not anticipate claim 1.

- a. “a heat shrink film comprising polyethylene terephthalate (PET) and having a first surface and a second surface opposite of the first surface”

63. In my opinion, Petitioner fails to show that the Gatorade label meets this claim limitation. Petitioner does not identify what it deems a “first surface” or “second surface opposite of the first surface.” The Petition only purports to show layer thickness. *See* Pet. at 17-21. Dr. Deible also does not identify which layer is the “first surface” and which is the “second surface.” He only presents cross sections of the Gatorade label. *See* EX1014 ¶¶ 62-64. Dr. Deible does not identify, however, what in the cross section figure he believes is the first or second surface.

64. In my opinion, it is necessary to identify a “first surface” because other claim limitations of the ’422 Patent require that certain layers be oriented according to that first surface. *See, e.g.*, EX1001 at cl. 1 (“a light blocking layer disposed adjacent the first surface”), cl. 15 (“wherein the first surface of the heat shrink film faces the external surface of the container”), cl. 16 (“wherein the indicia layer is disposed on the first surface”).

65. Neither Petitioner nor Dr. Deible identify or analyze the surfaces of the label that allegedly meet this limitation. Accordingly, it is my opinion that Petitioner fails to show that the Gatorade label meets this claim limitation.

- b. “a light blocking layer disposed adjacent the first surface and comprising a light blocking component”

66. In my opinion, Petitioner fails to show that the Gatorade label meets this claim limitation. Petitioner offers no argument or explanation that the Gatorade label contains “a light blocking layer disposed adjacent the first surface.” *See* Pet. at 21-29. In fact, as I discuss above, Petitioner does not identify the “first surface,” let alone the arrangement of a light blocking layer compared to the “first surface.” Pet. at 21-29. Petitioner cites broadly to Dr. Deible’s declaration and Figure 6. Pet. at 21-29. The descriptions of Figures 6b-d state that the “[i]mage is oriented such that the PET film is on the bottom of the image, and the surface at the top of the image is the surface that would contact the substrate,” but “substrate” does not appear in the claim language and nothing in the Petition or Dr. Deible’s declaration defines “the substrate” or how it is related to the claimed “surface.” Pet. at 22-27; EX1014 ¶¶ 65-66. Dr. Deible also cites his entire appendix rather than a specific figure to support his analysis of the configuration of “layers.” *See* EX1014 ¶ 66.

- c. “the light blocking layer being constructed for the recyclable shrink label to block at least 80% of incident light having wavelengths in a range of 200nm to 900nm”

67. Petitioner relies on a percent transmittance graph generated by Dr. Deible to show that the light blocking layer on the Gatorade label blocks at least 80% of incident light having wavelengths in a range of 200 nm to 900 nm. Pet. at 29-30; EX1014 ¶¶ 67-68. But Dr. Deible never indicates which regions of the Gatorade label sample he used to test the percent transmittance.

68. As seen in the image below, no are used all the way across the entire Gatorade label, as there are various regions containing different mixtures of inks. Therefore, knowing where Dr. Deible selected the portions to be tested is an important consideration in determining which ink is responsible for any purported light blocking.



Appendix C, FIG. 6.

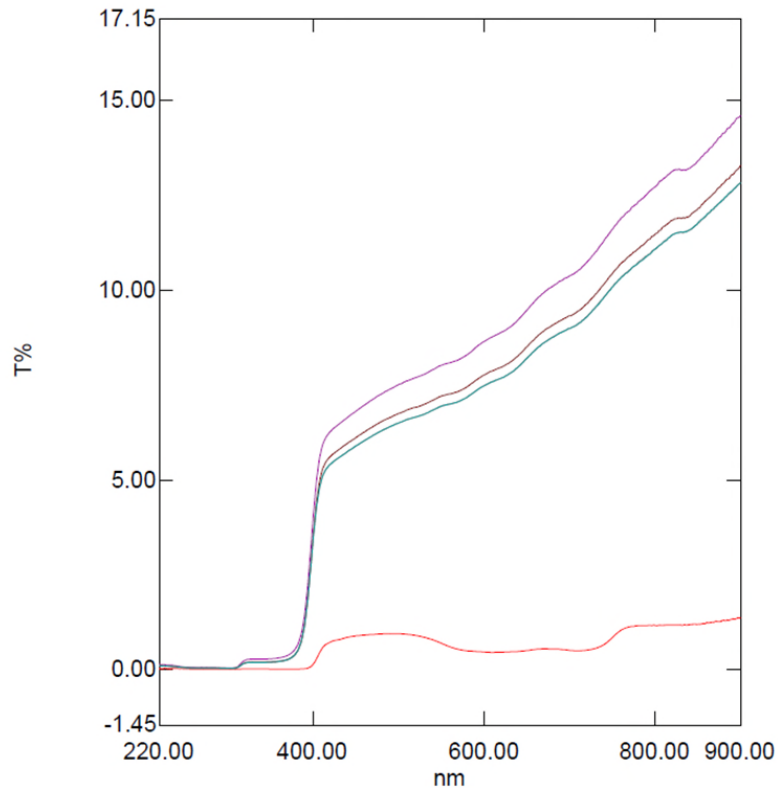
69. I understand, however, that Dr. Reitman performed optical transmittance testing on various portions of the Gatorade label, including a silver region, white region, orange region, and clear region. EX2012 ¶¶ 77-79, FIGS C25-29. Light transmission through the white, orange, and clear regions is well above 20% transmittance for large portions of the 200-900nm range. EX2012 ¶ 79, FIGS. C25-C29. Accordingly, the white, clear, and orange areas of the Gatorade label lack a light-blocking component as described by the '422 Patent.

70. I therefore understand Petitioner to allege that the silver ink of the Gatorade label is purportedly light blocking. Although Petitioner and Dr. Deible fail to identify the alleged “light blocking layer,” I conducted my

analysis with the understanding that the silver ink is the component Petitioner and Dr. Deible allege to be light-blocking.

71. Even assuming that Petitioner points to only the silver portion of the Gatorade label as the allegedly light blocking portion of the label, in my opinion, Petitioner fails to show that the light blocking layer is constructed for the recyclable shrink label to block at least 80% of incident light having wavelengths in a range of 200 nm to 900 nm as required by claim 1.

72. Petitioner's analysis assumes that the silver portion of the label covers the entire label, however, I understand Dr. Reitman performed cross-section SEM analysis and quantitative color thresholding measurements and determined the percentage of the Gatorade Label incorporating aluminum to be between 52-68%, leaving 32%-48% exposed to greater amounts of light. EX2012 ¶¶ 78-80. Moreover, Dr. Deible's transmittance testing shows that the silver portion of the Gatorade label purportedly blocks only around 85% of light near the 900nm range. EX1014 at FIG. 7 (maroon, green, and purple lines).



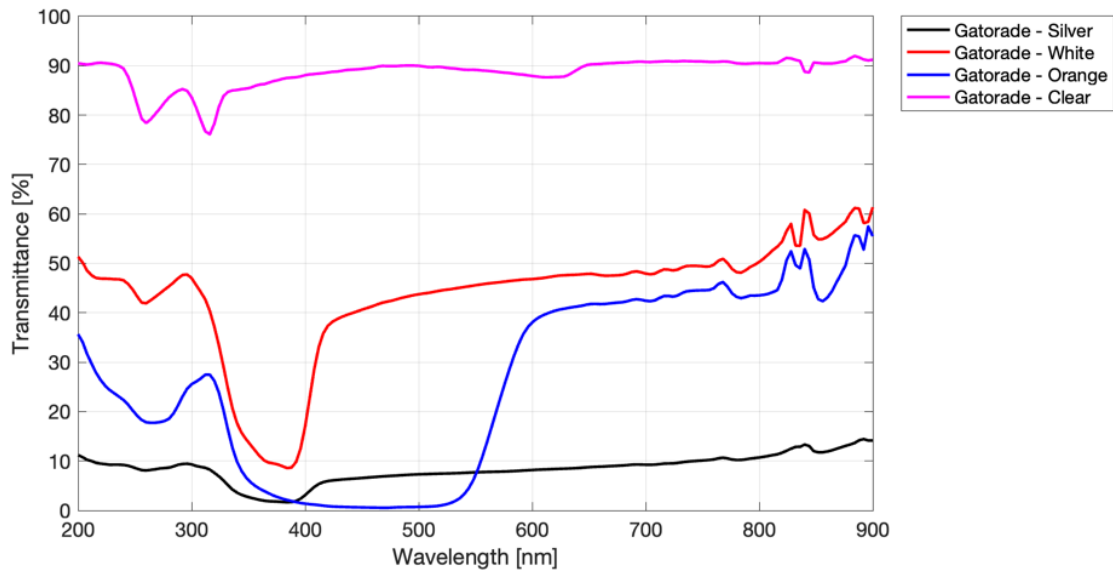
EX1014 at FIG. 7 (Transmission measurements of Febreze 3191115 (red spectra), and Gatorade 3191158 (purple spectra), 3191168 (maroon spectra), and 3191171 (green spectra))

73. The claims require that the light blocking layer must allow the claimed recyclable shrink label to block 80% of incident light across the 200-900 nm range and I understand Petitioner points to the entire label as the claimed “recyclable shrink label.” Pet. at 14. Therefore, even assuming 68% silver ink coverage (the high end of Dr. Reitman’s range), the Gatorade label still leaves 32% of the label exposed to much higher quantities of light that Dr. Deible does not measure. Under Dr. Deible’s analysis, therefore, the

Gatorade label, as a whole, blocks at most 57% of incident light according to the weighted average calculation below.

$$\text{Weighted Average} = (68\% \text{ silver portion coverage} \times 85\% \text{ transmittance}/100)$$

74. Even accounting for any potential light disruption from the non-silver portions of the label, the Gatorade label, as a whole, still would not block over 80% of incident light across the 200-900 nm range. I understand Dr. Reitman performed transmittance testing for the clear, orange, and white regions of the label. EX2012 at ¶¶ 75-79, FIG. C29. For the orange and white regions, Dr. Reitman concluded that these regions block approximately 50% or less of 800-900nm light, as shown in the image below. EX2012 at FIG. C29. The clear regions, on the other hand, only blocked approximately 10% for most of the 200-900 nm range, as shown in the image below. EX2012 at FIG. C29.



EX2012 at FIG. C29.

75. I further understand that Dr. Reitman quantified the amount of clear portions of the labels, which amount to approximately 23-27% of the label. EX2012 at ¶ 85. Therefore, even if I account for any incidental light blocking from the non-silver portions of the label, the average transmittance across the entire Gatorade label would be well under 80% in the 800-900 nm range. For example, assuming conservatively that the label consists of 68% silver, 23% clear, and 9% white/orange, the average across the entire Gatorade label would only be approximately 65% blocking near the 900nm range:

$$\text{Weighted Average} = ((68\% \text{ silver portion coverage} \times 85\% \text{ blocking}) + (23\% \text{ clear portion coverage} \times 10\% \text{ blocking}) + (9\% \text{ white/orange portion coverage} \times 50\% \text{ blocking})) / 100$$

76. This is a conservative estimate because it applies 50% transmittance for white and orange regions despite that those portions of the label have greater than 50% transmittance in the 850-900 nm range, and because some of the Gatorade labels have even less than 68% coverage of silver ink and up to 26% clear coverage.

77. Thus, the Gatorade label as a whole cannot block 80% of incident light across the 200 nm to 900 nm range and Petitioner provides no analysis to show how the entire Gatorade label is constructed to block 80% of incident light.

78. In my opinion, this is consistent with the purpose of the Gatorade label as an aesthetic, brand-specific marketing tool rather than a functional light-blocking label to protect perishable contents. Gatorade is not a perishable product. EX2015 at 1 (“Gatorade is a shelf stable product, not a perishable product like milk or juice.”). Therefore, the label serves an aesthetic rather than functional purpose. For example, as seen in the image below, the label allows customers to see the color of the Gatorade in the bottle. EX2014 at 6 (“Getting the hue right is critical, since many consumers know products like Gatorade by their color and not necessarily their name”).



EX1003 at 1

79. At base, in my opinion, Petitioner would need to distinctly identify any allegedly light blocking portions of the label separate from any other non-light blocking region of the label to identify whether the “light blocking layer” is constructed for the shrink label to block the incident light as opposed to a different ink layer or region. Yet, Petitioner fails to identify any layers at all as explained further in § V.A.3.

80. Therefore, in my opinion, Petitioner fails to meet its burden to show that the Gatorade label meets this limitation.

- d. “wherein the light blocking component comprises a particulate having a particle size of 0.1 μm to 100 μm ”

81. In my opinion, Petitioner has not shown that the Gatorade label meets this claim limitation. I understand that Petitioner and Dr. Deible contend that Figure 5 in Dr. Deible’s declaration depicts the particle size as claimed. Pet. at 35; EX1014 ¶ 70. I disagree. In my opinion, Petitioner’s testing, interpretation of test results, and presentation of test results are flawed in several respects.

82. I understand that, to show “particle size,” Petitioner refers to “aluminum flakes” in the ink as the “light blocking component” and appears to record a thickness measurement. *See* Pet. at 30, Fig. 5. In my opinion, this analysis is flawed. First, Dr. Deible states that Figure 5 shows that the flakes are greater than 0.1 microns and less than 100 microns. EX1014 ¶ 70. However, Figure 5 is not of high enough resolution to show the size of individual particles. Instead, Dr. Deible appears to measure the thickness of all the allegedly light-blocking components together. In my opinion, the thickness of the film, or the entire light-blocking component, is not a proper measurement of the particle size.

83. Dr. Deible also cites to Figure 6 as allegedly showing the light blocking component. Although Figure 6 appears to include zoomed-in

images, Dr. Deible does not identify any individual particle or provide measurements of any “particles.” Even these zoomed-in images do not, in my opinion, have adequate resolution to pick out individual particles clearly.

84. In addition, the manufacturer of the silver ink allegedly used in the Gatorade Label, Watson Standard, also does not provide information on the particle sizes for the silver ink. EX1019 (silver ink specification). Moreover, it cannot be determined if the particle sizes in the ink are the final particle sizes when deposited onto PET. If the aluminum is dissolved (or partially dissolved) in the ink, then the ink particle sizes may not reflect the printed and dried particle sizes.

85. In addition, the specification defines “particle size” as an “average particle size diameter measured by laser diffraction.” EX1001 at 14:8-10. Based on my review, there is no evidence that Dr. Deible measured the size of individual particles (and instead measured the thickness of the layer), let alone calculated an average of those measurements using laser diffraction. *See* EX1014 ¶ 70, Fig. 6.

- e. “wherein the recyclable shrink label is recyclable with a PET container”

86. In my opinion, Petitioner has not shown that the Gatorade label meets this claim limitation both because: (1) testing performed by both parties’ experts demonstrates that the Gatorade label is not recyclable

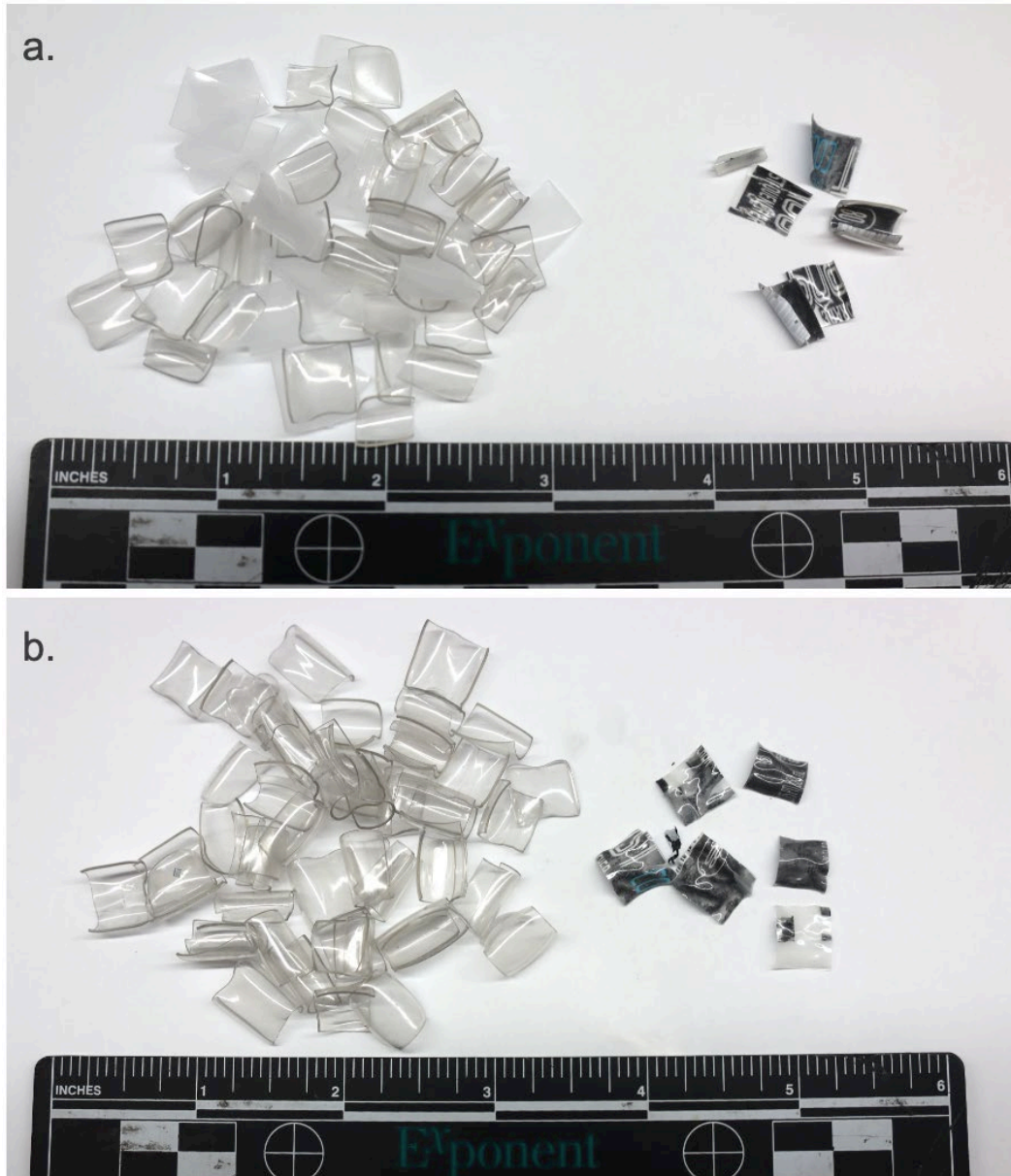
according to the claims of '422 Patent when read in light of the specification and prosecution history, (2) Petitioner's expert's analysis and documentation are flawed in ways that may bias the results, and (3) Petitioner relies on documents with no basis to support a connection to the Gatorade label or its alleged recyclability. I discuss each of these in turn.

i. The Gatorade label is not "recyclable"

87. In my opinion, Petitioner has not shown that the Gatorade label is recyclable in view of the claims of the '422 Patent. I have reviewed the testing performed by Dr. Maureen Reitman, who conducted, among other tests, caustic wash testing on the Gatorade labels relied on by Petitioner, which I discuss further below. I have also reviewed the evidence cited by Petitioner, including the declarations from Mr. Bushman, Dr. Deible, and the exhibits cited by each, which further support my opinion that the Gatorade label does not meet the recyclable claim limitation in the '422 Patent.

(A) Dr. Reitman's Testing Confirms That
The Gatorade Label Is Not Recyclable

88. Dr. Reitman's testing and the results obtained support my opinion that the Gatorade label is not recyclable because significant amounts of ink remain on the label after a caustic wash. For example, Figure C16 depicts the ink that the Gatorade label retained after a caustic wash. EX2012 at FIG. C11.

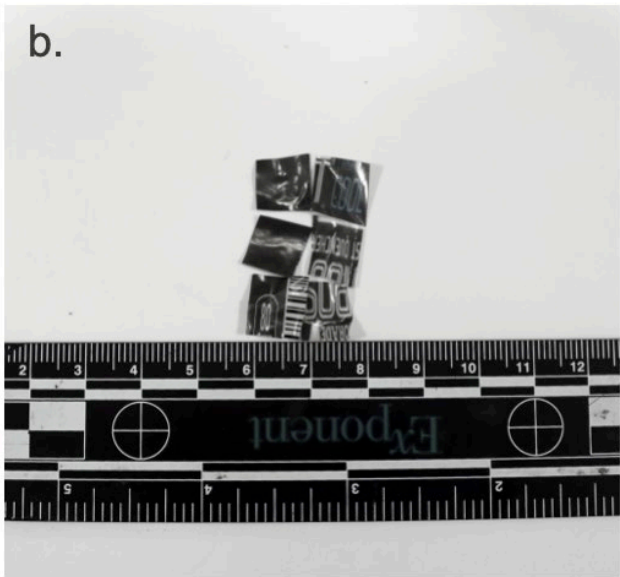
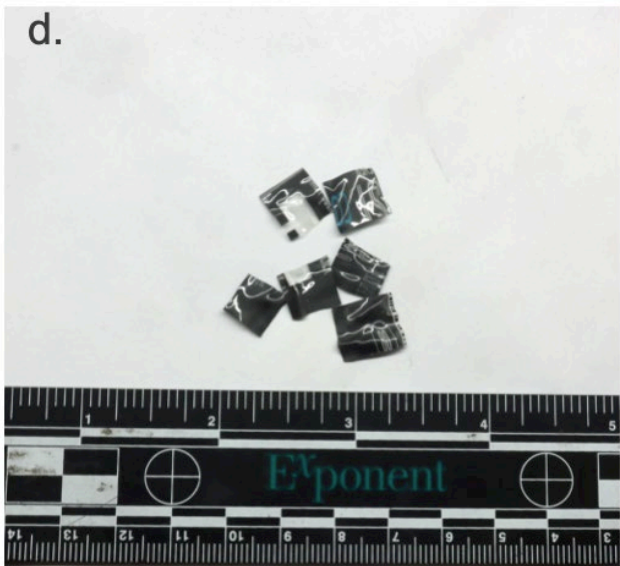


EX2012 at FIG. C11. Clear PET Flake (left) and Gatorade label (right) after hot caustic wash, warm water rinse, float test and drying. a. Water bath preshrunk Gatorade label. b. Hot air gun preshrunk Gatorade label.

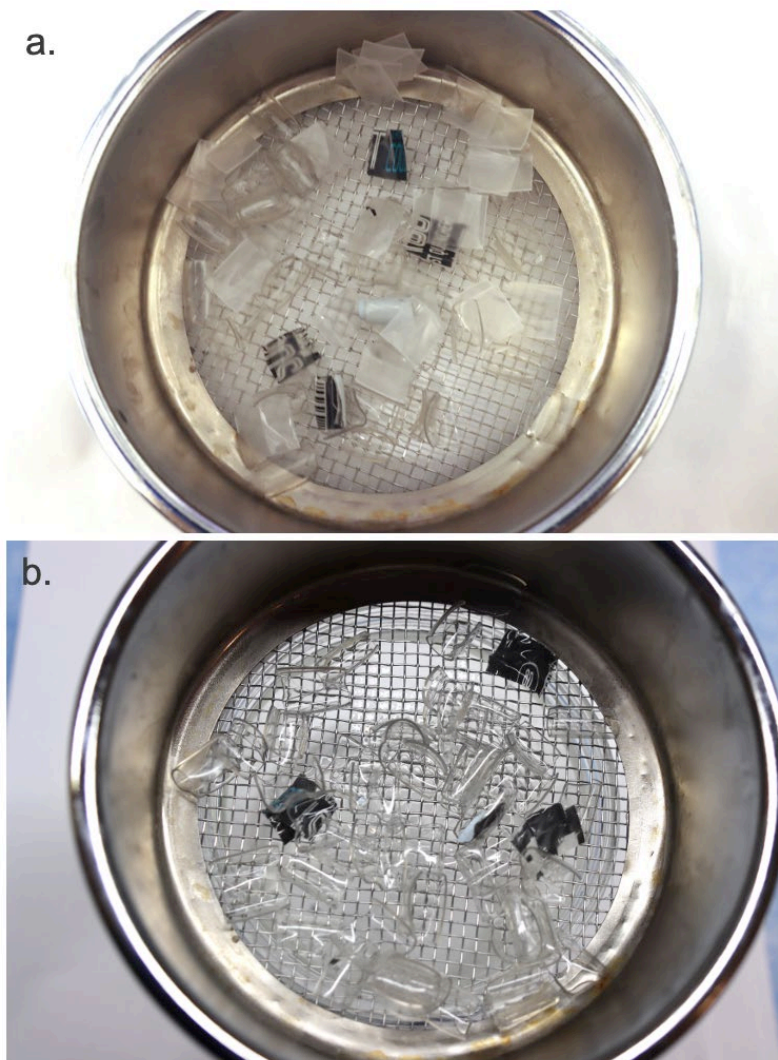
89. To replicate the results that Dr. Deible obtained, Dr. Reitman performed the caustic wash following the information outlined in Dr. Deible's declaration. EX2012 at Appendix D. Dr. Reitman prepared two

samples for testing. One sample was preshrunk using a water bath and the other using a hot air gun, as Dr. Deible testified he used. EX2012 ¶ 72; EX2011 at 193:2-5. As I explain further below, Dr. Deible's use of a hot air gun may improperly bias the results (although his results also show significant amounts of ink retained on the film as well), however under either approach it is clear that significant amounts of ink—if not all ink—are retained on the Gatorade label flake after a caustic wash.

90. For example, as can be seen in the before and after images below, Dr. Reitman's test results show that all or nearly all of the ink initially included on the Gatorade label flake is still present following the caustic wash evaluation.

Before Dr. Reitman's Caustic Wash	After Dr. Reitman's Caustic Wash
b.  EX2012 at FIG. C2b (water bath preshrunk Gatorade label)	 EX2012 at FIG. C11a (water bath preshrunk Gatorade label)
d.  EX2012 at FIG. C2d (hot air gun preshrunk Gatorade label)	 EX2012 at FIG. C11b (hot air gun preshrunk Gatorade label)

91. Images from the sieving process further demonstrate that the Gatorade Label retains significant amounts of ink after the caustic wash. EX2012 at FIG. C9. These images contain the clear control flake, which never contained any ink. EX2012 ¶ 71. Therefore, the images show that the Gatorade label flake retained significant (if not all) amounts of ink after the caustic wash testing.



EX2012 at FIG. C9: Preshrunk Gatorade label and clear PET flake after hot caustic wash, warm water wash, and filtering through a 10-mesh sieve. a. Water bath preshrunk Gatorade label. b. Hot air gun preshrunk Gatorade label.

92. Accordingly, Dr. Reitman's testing confirms that the Gatorade label retains significant amount of ink following a caustic wash. A POSITA would have understood that significant ink retention on the Gatorade label after caustic washing would introduce contaminants into the recycling

stream and therefore render the label non-recyclable. A POSITA would have been familiar with APR guidance that explains that inks retained on a PET film after a caustic wash become contaminants to the recycling stream. EX1009 at 2. For example, the Shrink Sleeve Labels on PET Containers APR Resource Document states that APR offers tests that can be used to identify inks that have negligible, if any, impact on PET recycling. An important consideration for inks on shrink sleeve labels is that the ink not contaminate or discolor the PET flake when mixed in hot caustic wash water used in the recycling process.” EX1009, 2. APR Critical Guidance provides an objective test to determine if retained inks (if any) are likely to affect the recycling process. For example, after performing a caustic wash test, APR recommends that label manufacturers perform an evaluation of molded plaques (melt-extruded resin, post caustic wash) to determine the color, haze, and amount of speck inclusions. EX1027 at 6.

Evaluation of molded plaques

Property	Test method	APR Guidance Preferred values
<u>Required values</u>		
L value of plaques B	Evaluation of PET Plaques for Color, Haze and Inclusions, PET-S-09	>82
a* value of plaques A and B	PET-S-09	Less than 1.5 units difference between plaques A and B
b* value of plaques A and B	PET-S-09	Less than 1.5 units difference between A and B
% haze of plaques A and B	PET-S-09	Control not to exceed 9% value, and test not to exceed more than 10% units greater than control.
Inclusions and specks in plaques T5	PET-S-09	If A = 0; B is 2 or less If A = 1; B is 4 or less If A = 2; B is 6 or less
IV loss when pellets re molded to plaques	ASTM D 4603 solution IV with phenol/tetrachlorethane at 30°, or ASTM D1238 – 13 method B	The value of IV loss for sample B is no greater than 0.025 units when compared to sample A

See EX1027 at 6

93. Moreover, the APR Standard Laboratory Testing Processing Practices guidance states that “plaques should be transparent and contain no haze from crystallinity.” EX1028 at 19. In my opinion, a POSITA need not perform such a test here, since a POSITA would immediately recognize that a label retaining all or nearly all ink would contaminate the PET flake and would not allow the underlying resin to be reclaimed. The Gatorade label retains significantly more ink than other labels that have failed similar APR testing. As an example demonstrating how the amount of Gatorade label ink retention compares with other label testing that did not pass APR certification, I have reviewed EX2038, which I understand is a test of a generic shrink sleeve label performed by PFE, a third party independent

laboratory on behalf of PO. The results of the test show that the label “does not meet all APR guidelines for PET” in part because “a side-by-side comparison of the label shows that the label ink only partially removed.” EX2038 at 5. As can be seen in the images below, the amount of ink retained on the Gatorade Label following Dr. Deible’s and Dr. Reitman’s caustic wash tests show significantly more ink retained as compared to the unsuccessful generic label test performed by an independent third party.

B+W Unsuccessful Wash Test Performed by PFE	Gatorade Label Results from Dr. Reitman	Gatorade Label Results from Dr. Deible
 EX2038 at 13	 EX2012 at FIG. C11a (water bath preshrunk Gatorade label)	 EX1014, FIG 11d (zoomed in)

94. Thus, a POSITA would have understood that the Gatorade label would not be recyclable because, as the '422 Patent states, labels are recyclable along with a container when the inks wash off such that the underlying resin can be reclaimed as reusable resin. Here, the inks on the

Gatorade label do not wash off the label in any meaningful way. In my opinion, Dr. Reitman's testing confirms that the Gatorade label does not meet this limitation because the retained inks would prevent the underlying resin from being reclaimed.

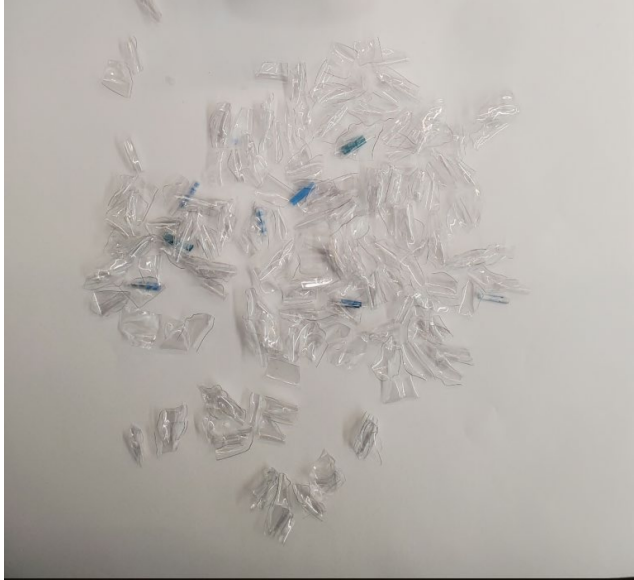
(B) Dr. Deible's Testing Also Confirms
The Gatorade Label Is Not Recyclable

95. Petitioner's contention that the Gatorade label is recyclable is based in large part on a caustic wash test performed by its expert Dr. Deible. I have reviewed Dr. Deible's testing methodology and results as described in his January 16, 2025 Declaration (EX1014) and in his October 14, 2025 Supplemental Declaration (EX1032). Dr. Deible asserts that the Gatorade label is recyclable under the '422 Patent claims because his testing showed that "ink is *being* removed" from the film. Pet. at 30. I disagree with both Petitioner's conclusion that the Gatorade label is recyclable and with Petitioner's statement that "ink [] *being removed*" is sufficient to meet the claim term "recyclable" in light of the specification and prosecution history. Pet. at 30.

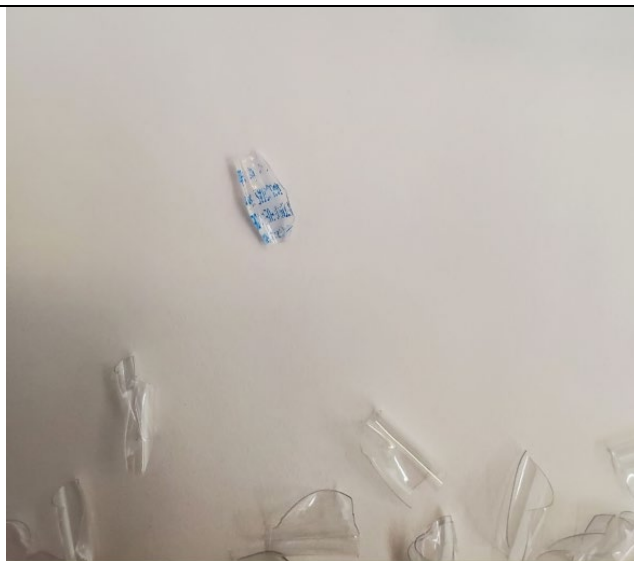
96. As a preliminary matter, Dr. Deible provides little analysis or documentation of the testing performed or the results obtained from his caustic wash testing. *See generally* EX1014 ¶¶ 71-79; FIGs. 11b-d. Dr. Deible's opinions are therefore largely conclusory and unsupported, and

deserving of little weight. Indeed, by providing very little documentation of his testing and results, it appears that Petitioner attempts to make Dr. Deible's testing appear more favorable. For example, while Dr. Deible provides both before and after images for the Febreze label testing, he does not provide any images of the Gatorade label flake prior to the caustic wash testing. *Compare* EX1014 at FIGs. 8-11a (before and after images for Febreze testing), *with* FIGs. 11b-d (zoomed in images of three separate Gatorade samples after caustic wash). This is problematic for many reasons described below, but notably because Dr. Deible's caustic wash test includes both clear control flake—which never contained any ink—and label flake. EX1014, ¶ 74 (“0.15g of preshrunk label flakes were mixed with 5 grams of [control] PET flakes”).

<u>Dr. Deible's Febreze Testing Images</u>	<u>Dr. Deible's Gatorade Testing Images</u>
 EX1014, FIG 8: Febreze label after preshrinking	No image of Gatorade label after preshrinking
 EX1014, FIG 8: Febreze label after preshrinking and cutting into flakes for testing	No image of Gatorade label after preshrinking and cutting into flakes

<u>Dr. Deible's Febreze Testing Images</u>	<u>Dr. Deible's Gatorade Testing Images</u>
 EX1014, FIG 9: Zoomed out image of 0.15g of Febreze label mixed with 5g of clear PET control before caustic wash	No zoomed out image of 0.15g of Gatorade label mixed with 5g of clear PET control before caustic wash
 EX1014, FIG 10: Zoomed out image of 0.15g of Febreze label mixed with 5g of clear PET control after caustic wash, float test, and drying	No zoomed out image of 0.15g of Gatorade label mixed with 5g of clear PET control after caustic wash, float test, and drying

Dr. Deible's Febreze Testing Images



EX1014, FIG 11a:

Zoomed-in image of one individual Febreze flake piece mixed with clear PET control after caustic wash.

Dr. Deible's Gatorade Testing Images



<u>Dr. Deible's Febreze Testing Images</u>	<u>Dr. Deible's Gatorade Testing Images</u>
	 EX1014, FIGs 11b-d: Zoomed-in images of individual Gatorade flake pieces from samples 3191157, 3191167, and 3191176 mixed with clear PET control after caustic wash

97. Dr. Deible further presents images of the caustic wash results for the Gatorade and Febreze labels without identifying which of the pieces shown in the images are label pieces and which are clear PET control pieces. This is a critical point, in my opinion because the clear PET control pieces never had any ink on them so it would be misleading to suggest that those pieces represent label pieces in which all the ink washed off, which Dr. Deible appears to suggest in his deposition. EX2012 at 204:11-17 (Q: Do you have any way to determine where the flakes on the bottom of Figure 11A are from the [control] water bottle or from the label? A: Not that was

done here, because the ink was removed during the wash, and they had just become clear PET flakes. In this image there's no way to determine the difference.”). I disagree with Dr. Deible’s suggestion that it is not possible to distinguish between the control flakes (which never contained any ink) and the Gatorade label flake. As I reference above, Dr. Reitman’s testing separates the Gatorade label pieces from the clear PET control pieces after the caustic wash to show that the label pieces showed little if any ink washing off. *See supra* § IX.A.1.e.i.A.

98. Moreover, as I explain further below, Dr. Deible’s failure to properly document the testing he performed and the results obtained make it difficult to analyze the results that he purports to have obtained, and upon which Petitioner relies. Furthermore, in the sections below, I also provide several critiques of Dr. Deible’s testing methodology and lack of documentation that could bias his results.

99. In sum, Dr. Deible’s testing is flawed and misleading, but ultimately confirms that the inks on the Gatorade label do not wash off and the Gatorade label is not recyclable.

(C) Issues with Dr. Deible’s Testing and Documentation

100. Although Dr. Deible’s testing supports my opinion that the Gatorade label is not recyclable because significant amounts of ink are

retained on the label, Dr. Deible's failure to properly document the testing he performed and the results obtained also make it difficult to analyze the results that he purports to have obtained, and upon which Petitioner relies, but could have biased his results. I also provide several critiques of Dr. Deible's testing methodology and lack of documentation in the sections below.

(1) Dr. Deible Relies on Improper
Evidence of the Febreze Label

101. While Dr. Deible's lack of documentation makes it difficult to meaningfully analyze and interpret his results, he appears to improperly rely on Febreze samples to demonstrate his analysis with respect to the Gatorade label. For example, Dr. Deible states that "portion[s] of samples 3191115, 3191157, 3191167, and 3191176 were preshrunk" and "cut into approximately 1 cm² pieces[.]" "as is represented in Figure 8[.] ([s]ee Appendix B)." EX1014 ¶ 72. But Figure 8 in Appendix B shows only a Febreze label. EX1014 at FIG 8.



Figure 8. Representative images of 3191115 being shrunk around a 1" pipe.

EX1014, at FIG. 8



Figure 8 (cont). Representative image of preshrunk 3191115 cut into approximately one square centimeter flakes.

EX1014, FIG 8



Figure 9. Representative image of 0.15 grams preshrunk 3191115 cut into approximately one square centimeter flakes and mixed with 5 grams of PET flakes.

EX1014, FIG. 9

102. Beyond the images of the Febreze sample, Dr. Deible provides no documentation showing which portions of the *Gatorade* label were used for the other samples, or how he “preshrunk” the portions of the *Gatorade* label. EX1014.

103. I understand the Board has acknowledged Dr. Deible’s lack of documentation of the Gatorade label and cautioned that evidence of the Febreze label is insufficient to show anticipation of the ’422 Patent claims by the Gatorade label. Paper 14 at 17-18 (“We agree with Patent Owner that

Febreze label evidence, or other non-Gatorade Label evidence, would not support Petitioner's challenge that the Gatorade Label anticipates claim 1."'). This lack of documentation is pervasive in Dr. Deible's analysis and poses challenges in interpreting and commenting on his opinions.

(2) Dr. Deible's "Preshrinking"
Procedure Could Have Material
Impact On Flake Integrity

104. In addition to his lack of documentation regarding the various samples Dr. Deible tested, the specific methodology he used for his testing may also have substantially biased the results he allegedly obtained. For example, Dr. Deible states that "portion[s] of samples 3191115, 3191157, 3191167, and 3191176 were preshrunk" and "cut into approximately 1 cm² pieces." EX1014 at 30. But Dr. Deible's declaration does not explain what method he used to pre-shrink the labels, what temperature was used, or what differences (if any) were used to shrink the Gatorade Label compared to the Febreze label. EX1014, ¶ 72.

105. These details are important to understanding and interpreting the results obtained by Dr. Deible. For example, the preshrinking procedure may have a significant effect on the ink integrity on the film. Over shrinking can lead to cracking that could cause the ink to flake off the film, as opposed to washing off, a process referred to as delamination. For example,

overheating and shrinking of polymer films is known to increase surface roughness and change surface energy, both of which will impact adhesion of ink on a film. EX2029 at 3 (“Depending on the heat treatment, the surface roughness of the polymeric films increased, indicating the formation of surface imperfections like cracks and cavities observed in previous studies.”). Heating to temperatures above the target temperature range for shrinkage in manufacturing could cause a mismatch in coefficients of thermal expansion, and thus delamination of the binder and ink from the PET substrate. EX2030. These conditions are not reflective of the caustic wash procedure during a traditional recycling process or consistent with procedures laid out in the APR certification guidelines or internal MCC testing protocols, which indicate that labels should be tested by shrinking them to the size to which they are intended to be shrunk. *See, e.g.*, EX1012 at 2; EX1006 at 6 (indicating intended labels should be tested on PET containers).

106. The amount of shrinking can impact the integrity of the ink adhesion to the label flake. For example, the MCC internal protocol and APR guidance both indicate that the test should be performed using preshrunk labels; indeed, it is intended that the labels “should be applied to containers and shrunk.” EX1012 at 2. “If containers with labels are not

available, loose labels may be tested but should be pre-shrunk prior to evaluation by shrinking **onto similar sized container.**” EX1012 at 2; EX1006 at 6 (for shrink and stretch sleeve labels, “[t]est intended labels on PET containers.”). The only indication Dr. Deible provides as to how he preshrunk the labels is related to his analysis of the Febreze labels, which as I mentioned above is not at issue with respect to Ground 1. Dr. Deible indicates that he preshrunk the Febreze label using a 1-inch pipe. EX1014 at FIG. 8. As can be seen in the image below, the Febreze label appears to be shrunk well past the amount it would have been shrunk when placed on a Febreze container.



Figure 8. Representative images of 3191115 being shrunk around a 1" pipe.

EX1014, Fig 8.

107. Although he does not show images of the pre-shrunk Gatorade label, Dr. Deible confirmed in his deposition that he performed the same procedure to preshrink the Gatorade label around the same 1-inch pipe,

therefore, I would expect the Gatorade label would be similarly wrinkled. EX2011 at 194:17-19. In fact, I measured the width of the Gatorade and Febreze label samples I received and determined that the Gatorade Label is approximately 42% wider than the Febreze Label (142 mm vs 100 mm). *See* Appendix C. As a result, the Gatorade label would likely have significantly more wrinkling than the Febreze label when preshrunk around the same 1-inch pipe. I understand Dr. Reitman performed a similar pre-shrinking of the Gatorade label around a 1-inch pipe and the results further support my opinions because the Gatorade label shows significant wrinkling, as shown below.



EX2012 at FIG. C1e

108. Over-shrinking resulting in excessive wrinkling and surface stress induced in the wrinkled PET film would account for any inks that may have been removed from the labels during the caustic wash test. *See* EX2029; EX2030. As explained above, Dr. Deible's testing shows little, if any, inks actually removed from the label flake after the caustic wash, however, to the extent Dr. Deible could show any ink actually removed from the Gatorade label, it would likely be the result of delamination caused by over shrinking rather than a result of washing off. Dr. Deible fails to account for or even acknowledge such possibility. *See* EX2029; EX2030.

109. In addition, Dr. Deible confirmed in his deposition that he used a heat gun to preshrink the labels. EX2011 at 193:2-5. It is not clear how long or what temperature was used with the heat gun to shrink the labels, but Dr. Deible acknowledges that the heat gun does not have temperature control. EX2011, at 192:20-193:1 (“It’s a -- a hot air gun so it doesn’t have a temperature gauge on it, so I don’t know.”). In contrast to Dr. Deible’s hot air gun preshrinking technique, the ’422 Patent provides that the labels should be shrunk using a water bath. EX1001 at 8:19-21. In fact, Dr. Deible did perform a water bath shrinking test for other parts of his analysis, EX1014 ¶ 87, FIGs. 18 and 19, but does not explain why he used a hot air gun method instead to preshrink the labels for the caustic wash test.

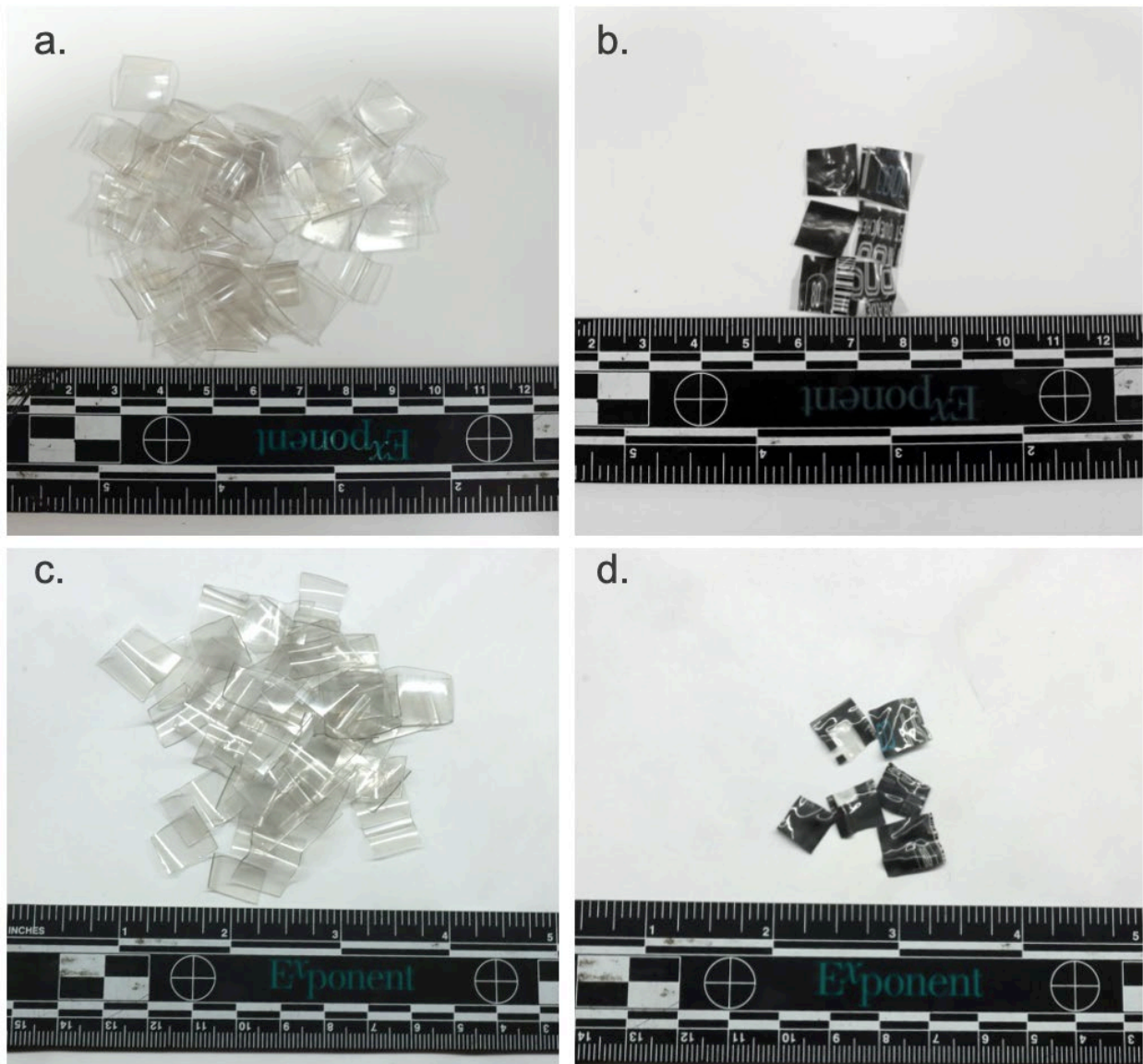
110. Dr. Deible’s confirmed use of a heat gun to preshrink the labels may have introduced localized excessive heating that could have impacted the integrity of the ink lamination to the label. This issue is magnified by the aluminum in the silver ink. Metallic inks affect heat transfer, and are known to cause uneven shrinking and distortion of the film. EX2033 at 13. Excessive localized heating, such as that produced by a heat gun, can cause the ink to delaminate from the underlying polymer due to a variety of mechanisms, such as incompatible coefficients of expansion at high temperatures, heat-induced changing of surface roughness and surface

energy of the PET, or even thermal decomposition of the inks, binders that hold the ink onto the PET, or of the PET itself. EX2033 at 13; *see also* EX2030. Any of these mechanisms could artificially increase the amount of ink that is removed from the label during a later wash cycle. Since the traditional recycling processes would involve labels attached to containers and shrunk under highly controlled temperatures and durations (i.e., not with a heat gun), Dr. Deible's testing may artificially appear to remove more ink off the label than would occur during a traditional recycling process. Here again Dr. Deible fails to account for or even acknowledge such possibility.

111. I understand that Dr. Reitman performed a caustic wash test using Gatorade label samples that were preshrunk using two different techniques. First, samples were preshrunk using a warm water bath; second, some samples were preshrunk using a hot air gun. EX2012 ¶ 64, FIG. C1-C2. It is clear that using the hot air gun introduced significantly more wrinkling compared to the warm water bath method, as shown in the images below, further confirming my opinions.



See EX2012 at FIG. C1



See EX2012 at FIG. C2.

112. To the extent Dr. Deible's preshrinking methodology caused any ink delamination and his results are inconsistent with results obtained by Dr. Reitman, Dr. Deible's results should be afforded less weight compared to Dr. Reitman's results obtained using a warm water bath. Regardless, as noted above, all tests performed by Dr. Reitman and Dr. Deible demonstrate

that the Gatorade label retains significant amount of ink after caustic wash despite any flawed methodologies.

(3) Dr. Deible Does Not Indicate
Where on The Gatorade Label
He Obtained Samples

113. Moreover, the images Dr. Deible includes in his declaration are purportedly only taken after the testing was completed. EX1014 at FIG. 11b (“after caustic wash, warm water wash, float test, and drying); 11c (same); 11d (same) and 12 (“warm water wash after sieving.”). He includes no images taken prior to or during the caustic wash procedure. Notably, Dr. Deible never identifies which portions of the Gatorade label he used to prepare the samples tested. EX1014 ¶ 72; EX2011 at 196:24-197:21 (“Q: Do you recall whether the pieces used for the caustic wash test were predominantly silver, were they predominantly clear, were they predominantly white ink, do you have a recollection of what the distribution is since we don’t have a photo of the pre-caustic wash Gatorade labels? A: I don’t recall, but the majority of the label or a large portion of the label is silver. So if you were selecting arbitrarily pieces, just pulling pieces, one would presume that you would get predominantly silver, but I don’t recall the specific distribution of which portions of the label were pulled.”). This is especially important because the Gatorade label contains multiple regions

with varying amounts and types of ink on the label, as can be seen in the images below. See EX1003.



EX1003 at 1 annotated to show region with no ink (orange is the liquid within the container)



EX1003 at 1 annotated to show region with white and black ink but no silver ink



EX1003 at 1 annotated to show region with silver ink



EX1003 at 1 annotated to show interface of multiple regions, including region with no ink, region with white and black ink, and region with silver ink.

114. It is unclear, therefore, whether Dr. Deible's results are representative of the entire Gatorade label or merely reflect a small subset of the ink regions. Indeed, Dr. Deible could not say one way or another

whether the samples used contained any silver ink. EX2011 at 197:13-21 (“Q: It is possible that you could have also arbitrarily selected a sample of the Gatorade label in which there was no silver ink? A: I -- I think that you would have to do that purposely. Q: But we don’t know because we don’t have an image of it, correct? A: Not in the document there’s not an image of that.”). To the extent there is any discrepancy between Dr. Deible’s results compared to Dr. Reitman’s, Dr. Deible’s results should be afforded less weight than Dr. Reitman who adequately documented which regions of the Gatorade label were selected and showed images of the label flake both pre- and post-caustic wash. EX2012 at FIGS. C2, C11.

(D) The Board Should Not Credit
Additional Evidence Unrelated to the
Gatorade Label

115. In support of its argument that the Gatorade label is recyclable, Petitioner cites additional documentation that Petitioner contends is related to the Gatorade label. I have reviewed the documents that Petitioner cites as supporting the conclusion that the Gatorade label is recyclable and find nothing to tie the documents to the Gatorade label in any way. Regardless, the additional documentation supports my opinions, rather than Petitioner’s arguments.

116. Specifically, Petitioner, Mr. Bushman, and Dr. Deible indicated that Exhibits 1016, 1018, and 1019 help support its claim that the Gatorade Label meets the '422 Patent claims requiring the label to be recyclable. Contrary to Petitioner's suggestions, Exhibits 1016, 1018, and 1019 do not show that the Gatorade labels are recyclable. As Mr. Bushman even concedes, none of these exhibits are specifically tied to the Gatorade label. EX2010 at 271:23-272:7.

117. First, Petitioner cites EX1016 and states that "the Gatorade Label is an SKC Ecolabel[] sleeve label" and that the APR "has recognized this label as meeting or exceeding APR's Critical Guidance Protocol." Pet. at 31. I have reviewed EX1016 and understand that EX1016 depicts information about a shrink film from SKC, referred to as the EL62 shrink film. However, nothing in EX1016 mentions the Gatorade label or in any way suggests that the Gatorade label is made using the EL62 material. Moreover, the document expressly provides that EL62 "is a clear ... PET film," and Petitioner cites no evidence tying this information to the inks used in the Gatorade label, despite attempts to imply such. Pet. at 31.

118. Second, Petitioner cites EX1018 as supporting its claim that it received APR certification for the Gatorade label. Petitioner states that "a Review Committee, appointed per the APR Recognition Operating

Procedures, reviewed an April 26, 2019 data submission and conclude[d] the data were correctly obtained by a qualified laboratory and were complete[ly] presented to show the labels submitted meet or exceed all critical guidance.” Pet. at 31. The APR letter in EX1018 provides no information about the Fort Dearborn ink system or how the Gatorade label relates to the ink system (if at all). Mr. Bushman testified that the APR certification was based on testing of a generic label and **not** the Gatorade label. EX2010 at 89:17-90:5. Moreover, Mr. Bushman acknowledged that the generic label did not include silver ink. EX2010, at 272:13-273:1 (generic label only tested magenta, cyan, blue, yellow, and white ink).

119. I understand Petitioner provided the data submitted in the June 2019 submission to APR after the Petition was filed. I have reviewed the data submission as well as Mr. Bushman’s deposition testimony regarding the submission, which confirms that the data submitted is not related to the Gatorade label. *See* EX1038; EX2010 at 272:4-7. Indeed, as can be seen in the image below, the label tested as part of the June 2019 data submission is a different label that includes only white, yellow, cyan, and black ink and does not include the silver ink that predominates the Gatorade label. EX1038 at 2.



EX1038 at 2.

120. The results obtained by the third-party independent lab on Fort Dearborn's washable ink system bear little resemblance to the testing Dr. Deible (or Dr. Reitman) performed on the Gatorade Label. For example, Fort Dearborn presented the following results comparing control flake to the washed test flake:



EX1038 at 7.

121. Moreover, unlike Dr. Deible, Fort Dearborn calculated and presented Black Speck and Plaque Color Data, quantitatively analyzing the impact of inks retained on the label, to the extent there were any, on the final extruded reclaimed resin pellets.

Black Specks

Plaque samples were examined for the presence of black specs over 0.015 in. Total area in the plaques is 3879 sq. mm per plaque with a total of 50 plaques examined for each test variable. The test variables all pass the specification.

870 – Control	870 – Test
1	1

EX1038 at 8.

Plaque Color Data								
Plastics Forming Enterprises, LLC								
Client: Fort Dearborn Company								
Project: SS CDG								
Experiment: Plaque Colors								
Type of Material:	Flake		Amorph Pellets		Bottle		Plaque	X
Project #: 855 Operator: BT								
Equipment: Konica Minolta CM-3600d								
Conditions: CIE Lab, 10 degrees, D65								
Run #	L * Values	a* Values	b* Values	L* Average	a* Average	b* Average	Haze	Haze Average
870 – Control	90.25	-0.72	6.60	90.26	-0.75	6.65	4.07	4.07
	90.29	-0.76	6.58				4.04	
	90.26	-0.74	6.61				4.03	
	90.24	-0.77	6.76				4.12	
	90.24	-0.78	6.72				4.10	
870 – Test	84.91	-2.25	7.61	84.88	-2.25	7.67	18.45	18.46
	84.86	-2.27	7.69				18.54	
	84.93	-2.31	7.71				18.45	
	84.92	-2.24	7.53				18.38	
	84.77	-2.20	7.80				18.47	

*The color data for each label material represents randomly selected plaque samples from the same population of material.

The APR specifies that plaque sample meet the following parameters in comparison to the control in order to be acceptable:

- A. L* >82 for all Blends
- B. Δa^* and b^* <1.5, (no problem)
- C. Control Haze <9.5%, Test Haze not to exceed 20% (no problem)

EX10138 at 9-10.

122. Accordingly, in my opinion, the 2019 data provided to APR for certification of the recyclability of Fort Dearborn’s washable ink system – which Petitioner has not even shown relates to the Gatorade Label – are in

contrast to the results obtained by Dr. Deible and Dr. Reitman. Therefore, the Gatorade label is clearly not consistent with the testing performed by Fort Dearborn to obtain APR certification of its washable ink system, contrary to Mr. Bushman's unsupported testimony. EX2010 at 243:21-244:6. Further, the stark contrast between the results obtained in EX1038 compared to the Gatorade label caustic wash results further demonstrates that the Gatorade Label is not recyclable as required by the '422 Patent because the Gatorade label visibly retained significant quantities of ink.

123. Moreover, the APR letter shown in EX1018 expressly provides that the "recognition applies only to the Fort Dearborn Recycle Friendly washable inking system and not necessarily to labeled bottles as those packages would need to be tested themselves to demonstrate the system of resin, adjuvants, labels, and closures conformed to the APR Critical Guidance Document and APR Design Guide." *See* EX1018. There is no evidence (1) that any testing of the sort was performed on the Gatorade label; or (2) that the Gatorade label would perform the same under similar testing. *See* EX2010 at 90:6-11 ("Q. So would the -- a commercial label product may differ from the label that was provided to the APR for testing ... to receive a letter like this? A. Yes."); 227:20-228:8 (Mr. Bushman testifying that he cannot recall ever performing caustic wash testing on the

Gatorade label); 272:13-273:1 (generic testing include cyan, magenta, yellow, black, and white ink).

124. Third, Petitioner cites EX1019, which appears to show a technical specification for a Watson Standard silver ink. Petitioner alleges that the silver ink described in EX1019 is purportedly used in the Gatorade label, but provides no basis for its assertion. Pet. at 31. There is no evidence tying this silver ink to the Gatorade label or Fort Dearborn ink system, and Dr. Deible did not perform any analysis to confirm if the Gatorade label uses such ink. EX2011 at 62:11-19. Nor is there evidence that “the silver ink used in connection with the Gatorade Label is supplied by ... Watson Standard.” EX1013 ¶ 57. Even if there were such evidence, EX1019 is not evidence that the Gatorade label is recyclable. Silver ink is not the only ink used on the Gatorade label. *See* EX2010 at 99:1-100:22 (confirming that the silver ink is not the only ink used for the Gatorade label or the entirety of the Fort Dearborn washable ink system). The Gatorade label depicts other colors, such as black, blue, orange, red, and white. *See* EX1003. And, as explained above, the silver ink was not tested as part of the June 2019 data submission to APR. *See* EX1038.

125. Moreover, Petitioner cites this data sheet to “confirm[]” that the Gatorade label’s “silver ink passes recyclability/bleed testing.” Pet. at 31

(citing EX1019). Even assuming Petitioner could show a connection between the Gatorade label and the silver ink described in EX1019, there is no indication that the silver ink is designed to wash off the film and therefore no indication that a label using the silver ink meets the claim term recyclable as used in the '422 Patent. Indeed, Mr. Bushman could not explain what “recyclability/bleed testing” entailed. *See* Pet. at 31; EX2010 at 103:24-104:23. Because there is no evidence in the record regarding what protocol was used to determine the recyclability/bleed testing referred to in EX1019, I am unable to analyze the results of the testing, or to even consider replicating it. I additionally note that EX1019 provides that “[d]ifferent results might be obtained in commercial use of this product under factory or field conditions.” *See* EX1019. There is nothing in the record to suggest that Petitioner tested the Gatorade label in commercial conditions, or after the silver ink had been applied.

126. Even putting all that aside, Petitioner’s contention that the silver ink passes “recyclability/bleed testing” does not suggest that the Gatorade label is recyclable. First, as I discussed above, Dr. Reitman and Dr. Deible’s test results show that the Gatorade label includes inks that do not wash off. EX2012 ¶¶ 69-70, FIG. C11; *see* EX1014 at FIGs. 11b-d. Second, in my opinion, passing a bleed test does not denote the recyclability

of the label. Recyclability/bleed testing typically relates to whether any inks wash off the label and significantly contaminate the stream by bleeding onto other flake or wash water. EX1031 at 3 (MCC internal caustic ink bleed test “to detail the procedure for evaluating ink bleed of plastic and/or paper labels used for PET bottles.”), 4 (“strongly discolored water is expected to be unacceptable”). Passing a bleed test, therefore, does not prove that the label can be recycled with the container according to the ’422 Patent and may in fact prove the opposite (i.e., that the inks are designed *not* to wash off the label). EX1009 at 2 (“An important consideration for inks on shrink sleeve labels is that the ink not contaminate or discolor PET flake when mixed in hot caustic wash water used in the recycling process.”).

ii. Summary

127. For each of the reasons explained above, it is my opinion that Petitioners have failed to show that the Gatorade label discloses a label that is recyclable with a PET container as required by the ’422 Patent in light of the specification and prosecution history, and therefore that Petitioners have failed to show that the Gatorade Label anticipates any claims of the ’422 Patent.

2. *Dependent Claims 2-3 and 5-18*

128. I understand that claims 2-3 and 5-18 depend from claim 1. Because it is my opinion that Petitioner has not shown that the Gatorade label anticipates claim 1, it is also my opinion that dependent claims 2-3 and 5-18 are also not anticipated by the Gatorade label.

3. *Dependent Claim 2*

[The recyclable shrink label of claim 1 further comprising an indicia layer.]

129. In my opinion, Petitioner fails to show that the Gatorade label anticipates claim 2. Petitioner contends that claim 2's required indicia layer is anticipated by "[e]ach label ... as can be seen in Figure 1." Pet. at 32. Dr. Deible contends the same. EX1014 ¶ 80. Petitioner does not explain how the indicia layer is met or indicate which part of the Figure purportedly meets this limitation. It is not enough to say that the Gatorade label features indicia, because the claims require that the indicia layer is a distinct layer from the other layers in the recyclable shrink label. EX1001 at cls. 1, 2 (claim 2 separately requiring both a light blocking layer and an indicia layer); EX1001, at 13:6-8.

130. Neither Dr. Deible nor Petitioner identify any discrete layers or provide any analysis to show that the Gatorade label is comprised of discrete layers, as opposed to a single ink layer composed of various adjacent regions

of different colors. It is visibly evident that there are multiple regions on the Gatorade Label that contain different ink compositions. EX1014 at FIG. 1. For example, in the image below, there are different regions of the label with different colors of inks visible (e.g., white, clear, orange, gray, silver, among others).



EX1014 at FIG. 1.

131. However, in my opinion, Petitioner fails to demonstrate that the various regions of the label are the result of ink *layering*, as described by the '422 Patent. *See, e.g.*, EX1001 at 13:6-8 (“Application of the high opacity coating composition onto the shrink film or *onto a layer* on the shrink film forms a high opacity layer.”). It may be, for example, that there is one single

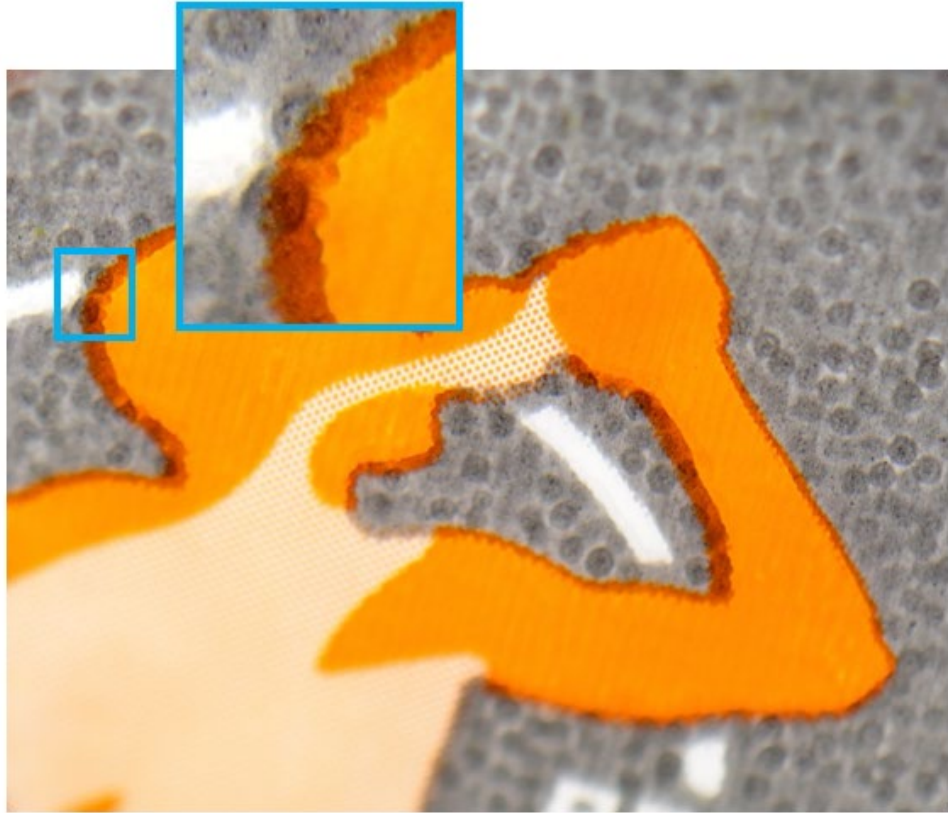
layer of ink deposited in adjacent regions where the various regions contain certain mixtures of ink rather than multiple ink deposits on top of one another. A magnified view of the Gatorade label itself supports this conclusion because the interfaces between the various regions appears to include an overlap of ink between two regions, as shown in the images below.



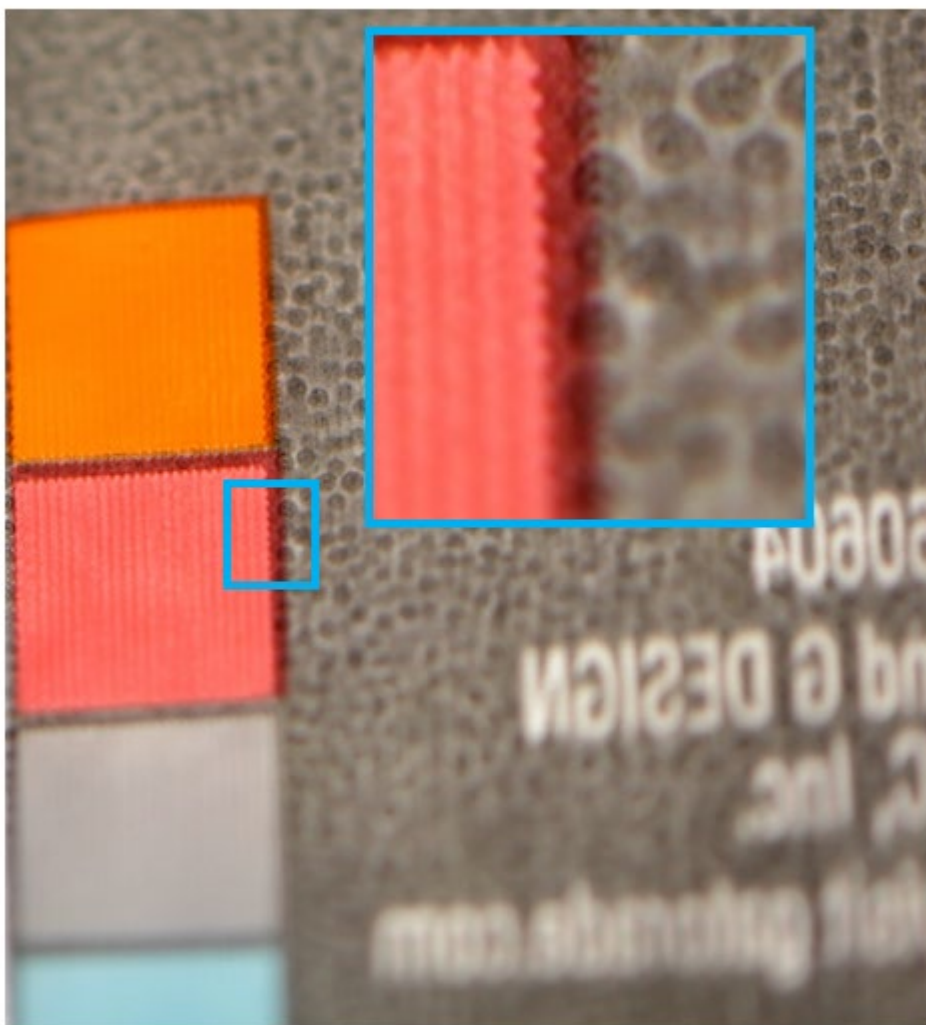
Appendix C at FIG. 19.

132. As seen in the image above, the silver portion of the label contains a characteristic pattern of circles that is not present in other regions (e.g., in the red square above). There is, however, a slight overlap at the interface between the silver region and, for example, the red square in the

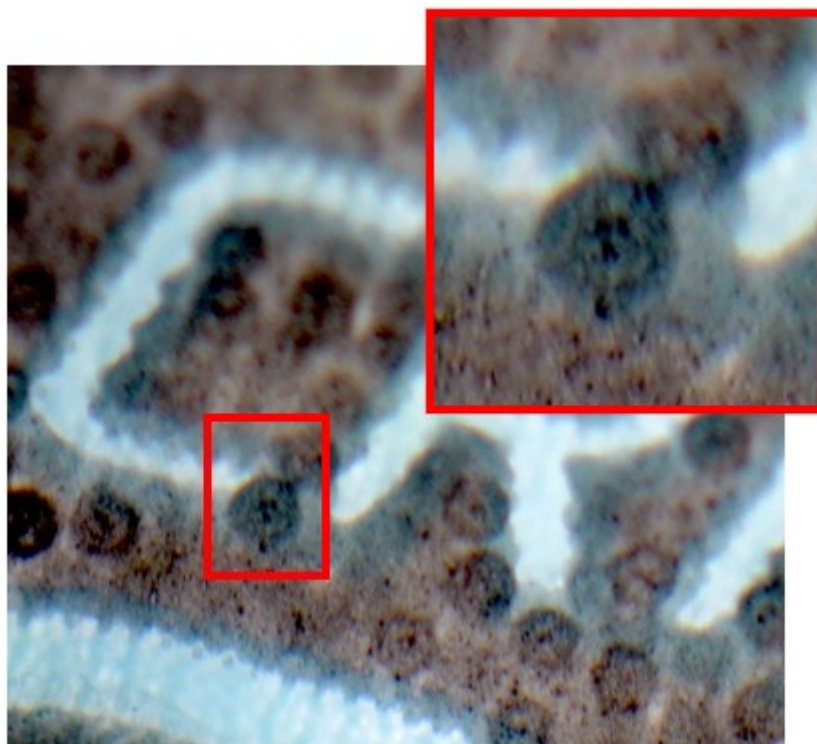
image above. This overlap is consistent with a practice common in the label printing industry, referred to as “trapping,” which is an intentional slight overlap of inks from one region to the next to avoid any gaps in color on the label when the label is printed. *See generally* EX2036. Notably, this trapping is only necessary where one ink mixture is deposited in one region and then a different ink mixture is deposited on an adjacent region. Trapping would not be required, for example, if one ink was deposited on top of another ink. EX2036. Images I took of the Gatorade label show this trapping effect. *See* Appendix C at FIGs 9-19. For example, using a backlight and a zoom lens on a Nikon camera, I photographed various interfaces.



Appendix C at FIG. 12 (annotated).



Appendix C at FIG. 19 (annotated).



Appendix C at FIG. 10 (annotated).

133. As can be seen in these backlit, zoomed-in photographs, the silver ink—containing the characteristic circles—overlaps with the adjacent layer, but is not present in the adjacent region. In my opinion, these images are consistent with an ink-printing process that would deposit a single layer of ink in which the regions of different color are deposited adjacent to one another as opposed to on top of one another. Thus, in my view, Petitioner has not shown that the Gatorade label comprises any discrete “layers,” such as a light-blocking layer, distinct from any other “layer.”

134. Accordingly, it is my opinion that the Gatorade label does not have “layers” (*i.e.*, distinct light-blocking and indicia layers) as required by claim 2 of the ’422 Patent. Therefore, Petitioner fails to show that the Gatorade label anticipates claim 2.

135. Moreover, Dr. Deible’s analysis is also insufficient to show “layers.” For example, Dr. Deible cites Figure 6 to identify various layers. EX1014 ¶ 81. In Figure 6, however, the dots (indicating where Dr. Deible took measurements) are left-right offset, which does not account for the “layers” required by the ’422 Patent. Dr. Deible took samples at two different parts of the label; but if the question was what layers the labels had, the dots should be on top of each other. Figure 6c is the only image in Figure 6 where the dots are stacked. But even there, Dr. Deible does not provide data disclosing where the dots are on the Z-axis.

136. Dr. Deible’s measurements for the Febreze label have the same problems.

137. Accordingly, Petitioner fails to show that the Gatorade label anticipates claim 2.

4. *Dependent Claim 3*

[The recyclable shrink label of claim 1 further comprising a high opacity layer comprising a white pigment.]

138. For the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there are any distinct “layers” separate from any other ink layer (e.g., light-blocking layer). Petitioner therefore fails to show that the Gatorade label anticipates claim 3.

5. *Dependent Claim 5*

[The recyclable shrink label of claim 1, wherein the heat shrink film consists of polyethylene terephthalate (PET).]

139. I understand Claim 5 requires that the “heat shrink film **consists** of polyethylene terephthalate (PET). EX1001 at cl. 5. Claim 5 is distinct from claim 1 in that the label must **consist** of, rather than be **comprised** of, PET. Compare EX1001 at 3:15-20 (“the term ‘comprises’...will be understood to imply the inclusion of a stated ... element ... but not the exclusion of an[y]other...element.”), with EX1001 at 3:21-24 (“[b]y ‘consisting of’ is meant including, and limited to, whatever follows the phrase ‘consisting of.’”). Petitioner and Dr. Deible, however, erroneously quote the claim limitation as “heat shrink film is **comprised** of polyethylene terephthalate (PET).” Pet. at 32; EX1014 at ¶ 82. Not only does Petitioner state the wrong claim language, but neither Petitioner nor Dr. Deible

perform any analysis or reach any conclusion that PET is the only compound present in the Gatorade shrink film, to the exclusion of other compounds. Petitioner thus fails to meet its burden to show that the Gatorade label anticipates claim 5.

6. Dependent Claim 10

[The recyclable shrink label according to claim 3, wherein the high opacity layer comprises a pigment selected from titanium dioxide (TiO₂), precipitated calcium carbonate (PCC), aluminum silicate, aluminum oxide (alumina), mica-based pigments coated with thin layer(s) of white pigment, or a combination thereof.]

140. For the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there are any distinct “layers” separate from any other ink layer (e.g., light-blocking layer). Accordingly, it is my opinion that Petitioner fails to show that the Gatorade label anticipates claim 10.

7. Dependent Claim 11

[The recyclable shrink label according to claim 1, wherein the light blocking component comprises zinc, aluminum, copper, silver, or an alloy thereof, titanium dioxide, carbon black, mica, a reflective pigment, a polymer capable of blocking light, a mineral capable of blocking light, or a combination thereof.]

141. For the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there are any distinct “layers” separate from any other ink layer (e.g., light-blocking layer). Accordingly, it is my opinion that Petitioner fails to show that the Gatorade label anticipates claim 11.

8. Dependent Claim 12

[The recyclable shrink label according to claim 1, wherein the light blocking layer is present in an amount of 0.5 ppr to 25 ppr relative to the recyclable shrink label.]

142. I understand that claim 12 requires “the light blocking layer is present in an amount of 0.5 ppr to 25 ppr relative to the recyclable shrink label.” EX1001 at cl. 12. In order to determine the amount of light blocking layer present on the Gatorade label, Dr. Deible performs an analysis based on conjecture with no evidence to support his assumptions. For example, Dr. Deible performed an Inductively Coupled Plasma (ICP) analysis to quantify the weight percent of aluminum in various samples. EX1014, ¶93. Stating, without support, that “[o]ne ream is understood to mean 3000 square feet of substrate,” Dr. Deible then used the weight percent to calculate the ppr of the light blocking layer by multiplying the purported light blocking weight percent obtained by ICP by 3000 square feet. EX1014, ¶ 92. Dr. Deible acknowledges that he assumed each sample “was uniformly covered by the light blocking layer” (EX1014, ¶ 93), yet fails to acknowledge that the label as a whole is not uniformly covered by silver ink. EX1014 at FIG. 1. Thus, Dr. Deible’s calculations significantly overestimate the amount of aluminum per ream.

143. Dr. Deible further states that “[t]he light blocking layer comprises other solid components along with the aluminum flakes. To compensate for the additional solids, an estimate of 10% of the mass of aluminum was included in the calculation of ppr for the light blocking layer.” EX1014, ¶ 93. Dr. Deible provides no explanation for what “additional solids” are present, why he accounted for these “additional solids,” or why he assumed that aluminum accounted for 10% of the solid weight. In his deposition, Dr. Deible confirmed that he only chose 10% because in his view (again, without support), 10% is a “conservative estimate.” EX2011 at 216:4-10 (Q: Why did you chose 10 percent? A: To try to be conservative. Q: Why is that a conservative estimate? A: Because the actual amount of solids in there...could range to higher numbers.”). EX1019, the technical data sheet for the silver ink Petitioner claims is used in the Gatorade label, discloses that the “[t]otal [s]olids” in the ink comprise 20.11% to 21.11% of the ink. *See* EX1019. To the extent Dr. Deible is deriving his 10% number from EX1019’s figure, he has not disclosed what additional solids are in the silver ink or how he arrived at that estimate.

144. It is also unclear how Dr. Deible conducted his experiment. For example, did he dissolve the sample and then use ICP for measurement, or did he use laser ablation ICP? I also don't see data that allows me to evaluate

the error in his experiments, particularly the error associated with measuring the area of his samples, the weights of his samples, the measured aluminum content, and the repeatability of his measurements in replicate experiments across replicates of labels. Because of these experimental and reporting deficiencies, I cannot verify the accuracy of Dr. Deible's calculations.

145. I understand that Dr. Reitman performed an analysis to determine the pounds per ream of aluminum. *See* EX2012 § VII.B. Specifically, using cross-section SEM and quantitative color thresholding, Dr. Reitman determined the percentage of the Gatorade Label incorporating aluminum to be between 52-68%. EX2012, ¶¶ 78-80. Dr. Reitman then compared the amount of the Gatorade label that contains aluminum to the amount that Dr. Deible estimated and determined that even using Dr. Deible's unsupported "conservative estimate" of 10% other solids, Dr. Reitman determined that the amount of aluminum present in the Gatorade label is 0.3ppr, which is below the claimed 0.5 to 25 ppr relative to the recyclable shrink label as required by claim 12. EX2012, ¶ 84.

146. For these reasons, it is my opinion that Petitioner fails to show that the Gatorade label anticipates claim 12.

9. Dependent Claim 13

[The recyclable shrink label according to claim 1, wherein the light blocking layer comprises from 0.1 ppr to 10 ppr of the light blocking component.]

147. I understand that claim 13 requires that “the light blocking layer comprises from 0.1 ppr to 10 ppr of the light blocking component.” EX1001 at cl. 13. In contrast to claim 12, claim 13 compares the weight of light blocking component to the light blocking layer (as opposed to the entire label). To calculate the relative ppr, or “pounds per ream,” EX1001 at 5:44, Petitioner continues to make conclusory assertions about the weight of the light-blocking layer similar to those I discussed above. In my opinion, Petitioner’s arguments for claim 13 fail for the same reasons I identify above for claim 12.

148. In my opinion, Petitioner’s analysis here is also vague and conclusory. For example, Petitioner contends that “the[se] values calculated fall into this range.” Pet. at 38. To the extent that Petitioner is trying to incorporate its analysis with respect to claim 12 into its analysis for claim 13, such wholesale incorporation is not effective. This is because claims 12 and 13 are different. Claim 12 requires “the light blocking layer is present in an amount of 0.5 ppr to 25 ppr relative to the recyclable shrink label[,]” while claim 13 requires “the light blocking layer comprises from 0.1 ppr to

10 ppr of the light blocking component.” EX1001 at 29:4-9. For claim 13, Petitioner does not explain the ICP test performed or how the values fall into the claimed range in its Petition, deferring instead to Dr. Deible’s declaration.

149. Accordingly, it is my opinion that Petitioner fails to show that the Gatorade label anticipates claim 13.

10. *Dependent Claim 14*

*[An article comprising:
a container comprising polyethylene terephthalate (PET) and
defining an external surface; and
the recyclable shrink label of claim 1 disposed on the
container.]*

150. In my opinion, Petitioner does not show that the Gatorade label anticipates claim 14. I understand that claim 14 requires a “container comprising polyethylene terephthalate (PET)”. EX1001 at cl. 14. Yet, Petitioner presents no evidence of an article comprising both a PET container and the Gatorade label together as of the priority date of the ’422 Patent. For example, the Petition’s claim-by-claim analysis section is entirely silent on what composition of container is used with the Gatorade label. *See* Pet. at 30-31. In the background section, the Petition merely states that “[t]he Gatorade Label is a shrink sleeve label that is recyclable with a PET container” and cites to Mr. Bushman’s declaration. Pet at 6-7

(citing EX1013 ¶¶ 53-60). Similarly, in Dr. Deible’s declaration, the claim-by-claim analysis is silent as to whether the Gatorade product used a PET container and the Overview of the Gatorade Label Section simply states “The Gatorade Label is a shrink sleeve label that is recyclable with a PET container.” EX1014 ¶ 57 (citing EX1013 ¶ 44). For his part, Mr. Bushman states that “[t]he containers to which the Gatorade Labels were attached are found in th[is] image.” EX1013 ¶ 58.



EX1013 at 24

151. However, this image appears to be a different product compared to the prior art cited by Mr. Bushman, Dr. Deible, and Petitioner (Orange flavor as opposed to the Frost or Passionfruit flavors relied upon) and more importantly, nothing in this image indicates that the container itself is made of PET or when this product was manufactured. Therefore, in my opinion, Peitioner has failed to show that the Gatorade label was used with a PET container as of the priority date of the '422 Patent and Petitioner fails to show that the Gatorade label anticipates claim 14.

11. *Dependent Claim 15*

[The article according to claim 14, wherein the first surface of the heat shrink film faces the external surface of the container.]

152. I understand that claim 15 depends from claim 14. *See* EX1001 at cl. 15. Because Petitioner does not show that the Gatorade label anticipates claim 14, Petitioner also does not show that the Gatorade label anticipates claim 15.

153. In my opinion, Petitioner does not show that the Gatorade label anticipates claim 15 for a second, independent reason. I understand that claim 15 requires that “the first surface ... faces the external surface of the container.” EX1001 at cl. 15. As explained in §IX.A.1.a above, Dr. Deible does not identify this “first surface.” Rather, Dr. Deible cites his entire

appendix. *See* EX1014 ¶ 99. I have reviewed the appendix and have found no demonstration of this layer configuration.

154. Therefore, in my opinion, Petitioner fails to show that the Gatorade label anticipates claim 15.

12. *Dependent Claim 16*

[The recyclable shrink label according to claim 2, wherein the indicia layer is disposed on the first surface.]

155. In my opinion, Petitioner does not show that the Gatorade label anticipates claim 16. Claim 16 requires that the “indicia layer is disposed on the first surface.” As explained in §IX.A.1.a above, Petitioner fails to identify what it deems “the first surface.” *See* Pet. at 38. Nor does Dr. Deible. *See* EX1014 ¶ 100. Rather than citing to a specific figure and identifying which layer he deems “the first surface,” Dr. Deible cites his entire appendix. *See* EX1014 ¶ 100. His analysis spans one sentence and contends that the layers are configured in a certain manner without any additional explanation or analysis. *See* EX1014 ¶ 100

156. In addition, for the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there are any distinct “layers” separate from any other ink layer (e.g., light-blocking layer). Accordingly, it is my opinion that Petitioner fails to show that the Gatorade label anticipates claim 16.

13. *Independent Claim 19*

157. In my opinion, Petitioner has not shown that the Gatorade label anticipates claim 19.

- a. “having a first surface and a second surface opposite of the first surface”

158. In my opinion, Petitioner does not demonstrate that the Gatorade label meets this limitation for the same reasons I described above with respect to claim 1. *See supra* § IX.A.1.a.

- b. “a light blocking layer disposed adjacent the first surface and comprising a light blocking component, the light blocking layer being constructed for the recyclable shrink label to block at least 80% of incident light having wavelengths in a range of 200 nm to 900 nm”

159. In my opinion, Petitioner does not demonstrate that the Gatorade label meets this limitation for the same reasons I described above with respect to claim 1. *See supra* §§ IX.A.1.b, IX.A.1.c.

- c. “a high opacity layer comprising a white pigment,”

160. In my opinion, Petitioner has not shown that the Gatorade label meets this claim limitation. For the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there is a distinct “high opacity layer” separate from any other ink layer (e.g., light-blocking layer).

161. In addition, Petitioner contends that the “high opacity layer incorporates a white pigment, as can be seen in Figures 6 and 14.” Pet. at

40. I have reviewed Figures 6 and 14. Figure 6 does not show (or provide any explanation) that the high opacity layer incorporates a white pigment. Although Figure 14 appears to depict a white pigment, nothing in the image shows, nor does Dr. Deible contend, that the white pigment is part of the high opacity layer as this claim limitation requires. Petitioner also cites to Dr. Deible's declaration, but the cited paragraph does not reference any "white pigment." *See* Pet. at 40 (citing EX1014 ¶ 106).

162. Accordingly, in my opinion, Petitioner fails to show the Gatorade label meets this claim limitation.

d. "wherein the recyclable shrink label is recyclable with a PET container."

163. In my opinion, Petitioner does not demonstrate that the Gatorade label meets this limitation for the same reasons I described above with respect to claim 1. *See supra* § IX.A.1.e.

B. Ground 2: The Gatorade Label and Mitchell Do Not Render Claim 4 Obvious

164. I understand that Petitioner contends that the Gatorade label, based on knowledge of a POSITA, including Mitchell, render claim 4 obvious. Based on my review, I do not believe that the Gatorade label in combination with the knowledge of a POSITA, including the Mitchell

reference render obvious claim 4 of the '422 Patent for at least three independent reasons.

165. First, in my opinion, Ground 2 fails because Petitioner focuses solely on the additional limitation claim 4 adds to claim 1 but does not present any evidence that the knowledge of a POSITA renders obvious the other elements of claims 1 and 3 from which claim 4 depends. *See* Pet. at 47 (arguing only the obviousness of changing layer order to meet additional limitation of claim 4). Because I understand Claim 4 incorporates all the elements of Claims 1 and 3, for all the same reasons described in my response to Ground 1 above, the Gatorade label does not meet the elements of claim 1 or claim 3 and therefore Petitioner fails to show how the Gatorade label, based on the knowledge of a POSITA renders obvious claim 4.

166. Second, for the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there are distinct “layers” (e.g., “light-blocking layer” or “high opacity layer”) separate from any other ink layer (e.g., “indicia layer”).

167. Third, even assuming Petitioner could show distinct layers, it is my opinion that Ground 2 fails because Petitioner has not shown a motivation to combine or a reasonable expectation of success in re-ordering

the alleged “layers.”¹ I also note that Petitioner and Dr. Deible do not make clear which arguments relate to motivation to combine, and which relate to reasonable expectation of success. *See* Pet. at 43-47; EX1014 ¶¶ 114-122. Regardless, neither have merit and I address each inquiry in turn.

1. Gatorade Label Combined with POSITA Knowledge Does Not Disclose or Render Obvious All Limitations of Claim 4

168. I understand Petitioner’s only assertion for claims 1 and 3 are anticipation by the Gatorade label alone and that Petitioner raises no argument regarding obviousness of those claims. With respect to claim 4, Petitioner’s only obviousness argument relates to the additional limitation present in claim 4 beyond what is claimed in claims 1 and 3. However, I understand that as a dependent claim, claim 4 incorporates the limitations of

¹ To the extent the Board finds that Petitioner has shown that the Gatorade label consists of ink “layers,” Petitioner fails to show that it would be obvious to modify the Gatorade label as Petitioner contends. I therefore respond to Petitioner’s arguments regarding the order of “layers” in this section. Any reference to “layers” is solely for the purposes of responding to Petitioner’s assertions but is not intended to be construed as an admission that the Gatorade label consists of ink “layers.”

claims 1 and 3 and adds the additional limitation “wherein the recyclable shrink label comprises an indicia layer and wherein the high opacity layer is disposed between the indicia layer and the light blocking layer.” EX1001 at cl. 4. Although Petitioner’s analysis under Ground 2 does not even mention claims 1 and 3 or any of the associated limitations, even assuming Petitioner intended to incorporate its prior analysis of those limitations, it does not make any obviousness arguments related to those limitations. *See* Pet. at 47. Instead, Petitioner states that “[i]f the teachings and knowledge of a POSITA, including those disclosed in Mitchell et al. (US 2017/0223879), were combined with the Gatorade Label, the indicia layer, the high opacity layer, and the light blocking layer would be structured such that the high opacity layer is positioned between the indicia layer and the light blocking layer.” Pet. at 47. I therefore understand Petitioner is only providing an obviousness analysis with respect to the additional limitation in claim 4 related to the order of the layers.

169. Petitioner fails to acknowledge, however, the Patent Office has already considered the Mitchell reference including essentially the same argument during prosecution and PO overcame the examiner’s rejections. *See* EX1002 at 335-37. For example, the examiner initially rejected PO’s claims, including what eventually issued as claim 4, as obvious over

Mitchell, a reference that discloses a label with a multi-layer design including a “metallization layer 7 on the second skin layer.” EX1002, at 336. Applicant, however, asserted that Mitchell does not teach or disclose a label that is recyclable with a PET container for multiple reasons and amended the claims to include the limitation “wherein the recyclable shrink label is recyclable with a PET container.” EX1002 at 316, 335-37. The examiner agreed and withdrew the rejection based on Mitchell. EX1002 at 357. Petitioner’s arguments here—reordering layers to match Mitchell’s configuration—amount to the same analysis already conducted by the examiner and should likewise be rejected. As I explain in detail above, it is my opinion that the Gatorade Label does not disclose all of the elements of claims 1 and 3 and therefore the Gatorade Label, combined with the alleged knowledge of a POSITA with respect to the order of any layers, likewise does not disclose all the elements of claim 4 and cannot render the claim obvious.

2. POSITA’s Knowledge

170. I understand that Petitioner asserts in Ground 2 that the Gatorade Label, based on knowledge of a POSITA (including Mitchell) renders claim 4 obvious. *See* Pet. at 41. Dr. Deible asserts that “it would have been obvious to a skilled artisan in the field of labels to change the

order of the layers.” EX1014 ¶¶ 108-109. First, I note that Dr. Deible does not have any experience in the field of labels, nor does Dr. Deible opine that label design is part of the definition of skill in the art in this case. *See* EX1014 ¶ 24. Accordingly, it is my opinion that Dr. Deible would not have the experience or knowledge necessary to opine on label design and ink layering. In contrast, as I explain above, I have experience with label design in addition to other experiences. *See supra* § IV.

171. Moreover, although Dr. Deible broadly asserts that the knowledge of a POSITA would render obvious claim 4, he only cites one prior art reference—Mitchell—as evidence of the knowledge of a POSITA. Dr. Deible never even read Mitchell, however. EX2011 at 118:3-9. Moreover, as I explain above, Mitchell was already cited by the examiner and overcome during prosecution history because Mitchell does not teach or disclose a recyclable PET label. *See infra* § IX.B.1. Dr. Deible, therefore, cites no evidence of a POSITA’s knowledge of a recyclable, light blocking shrink label prior to the ’422 Patent. That is consistent with my understanding of the state of the art as of the priority date for the ’422 Patent, which is replete with evidence of the challenges of designing a recyclable, light blocking shrink label. For example, as I explain in § IX.B.5, below, the ’422 Patent discloses that players in the industry

traditionally used “color impregnated bottles or containers” or “white shrink films” to create light-blocking labels, EX1001 at 1:20-23, but because “[t]he market for recycling color impregnated PET [was] very small,” “most of those bottles and containers [were] not recycled.” EX1001 at 1:23-25. And sometimes, white shrink films would be printed “without functional light blocking layers.” EX1001 at 1:20-23. In addition, contemporaneous evidence from the industry confirms the lack of a comprehensive solution that the ’422 Patent provided. For example, in April 2024, Nestlé issued a press release announcing its plans to “[m]ake[] [b]ottles [e]asier to [r]ecycle for [c]onsumers.” EX2017 at 1. The press release discusses Nestlé’s efforts to develop the shrink sleeve label for its products. Specifically, Nestle stated that “[w]hen Nestlé first set out to transition its Nesquik bottles to a recyclable sleeve in 2019, there was no recyclable solution available in market yet that also leveraged the light-blocking features required for the product.” EX2017, at 2. In my opinion, this shows that there was a longstanding problem for which there was no existing solution.

172. Similarly, an April 2024 article from PackagingDive discusses Nestlé’s plan to use recyclable, light-blocking shrink sleeves on some beverage products. *See* EX2005. As stated in the article, “Shrink sleeves, when they use certain materials, inks, and adhesives, can be a common

barrier to proper bottle recycling. Problematic label constructions landed on the U.S. Plastics Pact's list of problematic and unnecessary materials." EX2005, at 2.

173. Petitioner's own patents further confirm the challenges of creating a recyclable, light blocking shrink label. For example, as I explain in § IX.B.4, Petitioner's patent application 2025/0273094 states in the Background section that "label materials can cause contamination to the PET recyclate when they sink to the bottom of the caustic bath along with the PET article ... In addition, the ink components attached to those dense label materials can further impact recyclate quality." EX2016 at [0008].

174. Thus, in my opinion, despite Dr. Deible's failure to cite any evidence of a POSITA's knowledge of the state of the art at the time of the '422 Patent, the contemporaneous evidence shows a complete lack of knowledge for how to create such a recyclable, light blocking label.

3. Petitioner Has Not Shown Any Credible Motivation to Combine

175. It is my opinion that a POSITA would not have had a motivation to modify the Gatorade Label in any way let alone combine it with a teaching from Mitchell. Nor has Petitioner shown any credible motivation to combine the Gatorade label with Mitchell other than hindsight.

176. Label design is often driven by brands and based on functionality as well as aesthetics. This is confirmed by Mr. Bushman, who testified that label design is dictated by “graphical design intent for the brand.” EX2010 at 136:14-19. Moreover, the ordering of ink “layers” is also dictated by the brand needs, as Mr. Bushman acknowledged. EX2010 at 136:20-22.

177. According to Mr. Bushman, the Gatorade Label “was put into commerce at least as early as 2020” and “is very popular and hundreds of millions of labels have been supplied to the market with this label construction.” EX1013 ¶ 55. Mr. Bushman further testified that the Gatorade Label relied upon in this case is still being supplied to the market with changes only to the ink suppliers and substrate vendors. *See* EX2010 at 84:17-85:12. Moreover, PepsiCo, Gatorade’s manufacturer, acknowledges that Gatorade labels are specifically designed for consumer interaction rather than functionality as a light-blocking label. *See* EX2014 at 6 (according to PepsiCo’s vice president of research and development, “[g]etting the hue right is critical, since many consumers know products like Gatorade by their color and not necessarily their name”); EX2015 at 1 (“Gatorade is a shelf stable product, not a perishable product like milk or juice.”). In my opinion, a POSITA would not have been motivated to make changes to a brand-

specific label that is commercially successful and which was likely designed for a particular customer aesthetic rather than a functional benefit. Nor would a POSITA even necessarily recognize that the Gatorade Label had any light-blocking capability. For example, Gatorade is a shelf-stable product whose label does not cover the entire container and features clear portions within the label itself, all of which would convey to a POSITA that the functionality of the label is not intended to prevent light from spoiling or interacting with the contents of the container. Indeed, I understand Dr. Reitman performed transmittance testing on various color regions of the label and determined that the white, clear, and orange regions block less than 20% of light in the 200-900 nm range. *See* EX2012 ¶ 79, FIG. C29. Dr. Reitman further quantified that the silver portion of the Gatorade label only accounts for 52-68% of the total label. *See* EX2012 ¶ 80. And, the Gatorade label does not even cover the entire container. *See* EX1003. Thus, a POSITA would not have considered that Gatorade label to be functionally light blocking and would not have been motivated to make changes to the Gatorade label's light-blocking functionalities.

178. Even assuming a POSITA would have had any motivation to modify the Gatorade label or would have even recognized that the Gatorade Label had light-blocking functionality, a POSITA would not have looked to

Mitchell's teachings to achieve a different layer configuration for a recyclable light-blocking shrink label because Mitchell taught a label that is removed from the container prior to entering the recycling stream (and is therefore not recyclable under the '422 Patent). For example, Mitchell teaches that "[a]t the time of recycling the PET bottle, a label attached to the PET bottle, is separated and removed." *See* EX3002 at [0002], [0003], [0240]. A POSITA would not have been motivated to modify a non-recyclable Gatorade label that has no clear intention of being light blocking using teachings from Mitchell, a reference that teaches a non-recyclable label, in order to achieve a recyclable light-blocking label with a different layer configuration.

179. Petitioner adduces seven reasons why a POSITA would have had a motivation to combine and a reasonable expectation of success. *See* Pet. at 44-47. Dr. Deible's reasoning is virtually identical to the Petition. *See* EX1014 ¶¶ 116-122. As I stated above, Petitioner does not clearly delineate its motivation to combine arguments from its reasonable expectation of success arguments. I attempt to categorize each argument as such merely as a way to respond to each argument. Regardless of whether each argument is categorized as motivation to combine or reasonable expectation of success, I find none of Petitioner's reasons convincing.

180. **Petitioner’s First Reason.** I understand that Petitioner’s contends that a POSITA would have had a motivation to combine because: (1) “recyclable packaging has been known for decades”; and (2) “the market has required light protective packaging, so as to block light waves that are harmful to ingredients.” Pet. at 44; EX1014 ¶ 116. I do not dispute that a POSITA would have been aware of recycling packaging and the market desire for light protective packaging. I disagree, however, with Petitioner’s contention that these general market observations would have spurred a POSITA to *reorder* the layers of the Gatorade label as Petitioner proposes. Petitioner offers no reasoning to support such an argument. Petitioner fails to recognize that the Gatorade label is a shelf-stable product that does not require light-blocking to preserve the quality of the underlying product. EX2015 at 1 (“Gatorade is a shelf stable product, not a perishable product like milk or juice.”). A POSITA would not have been motivated to modify the Gatorade label simply because the market understood a need for light-blocking labels for certain products which are negatively affected by light (*e.g.*, dairy products). To the extent Petitioner is arguing that the Gatorade label and Mitchell “serve similar purposes,” Pet. at 44-45; EX1014 ¶ 117, I disagree with that statement, as I explain below.

181. **Petitioner's Second Reason.** I understand that Petitioner contends that a POSITA would have had a motivation to combine because a POSITA “would have knowledge of both labels” and “would know that they serve similar purposes.” Pet. at 45; EX1014 ¶ 117. I disagree that the Gatorade label and Mitchell are similar in purpose. Petitioner appears to contend that the Gatorade label and Mitchell “serve similar purposes” because both are “shrink label[s] that [are] light blocking.” Pet. at 44; EX1014 ¶¶ 116-117. There are two problems with this statement. First, it ignores the fact that Mitchell teaches a label, as both parties agree, that was not designed to be recyclable with a PET container. Indeed, Mitchell teaches removing the label from its container before recycling. *See* EX3002 at [0002], [0003], [0240] (“At the time of recycling the PET bottle, a label attached to the PET bottle, is separated and removed.”). I also understand that Dr. Deible agreed during his deposition that Mitchell is not recyclable. *See* EX2011 at 237:22-238:1. In my opinion, recyclability is core to the '422 Patent: recyclability was relevant to the Examiner's decision to allow the claims during prosecution, and it sits at the center of the instant dispute. I disagree, therefore, that the Gatorade label and Mitchell “serve similar purposes” if, under Petitioner's theory, one is recyclable, and the other is not. Of course, as I discussed above with respect to Ground 1, it is my

opinion that the Gatorade label is also not recyclable, but I make this point to highlight the tensions between Petitioner’s arguments in Ground 1 and 2.

182. Second, the Gatorade and Mitchell labels serve different purposes with respect to light-blocking. As I explained above, I do not believe that a purpose of the Gatorade label is to block light. Upon visual inspection, the Gatorade label covers only a portion of the container, and the label boasts clear, see-through sections. *See* EX1003. If anything, it appears that the label has been designed precisely so that an outside observer could see the color of the beverage within. *See* EX2014 at 6 (according to PepsiCo’s vice president of research and development, “[g]etting the hue right is critical, since many consumers know products like Gatorade by their color and not necessarily their name”); EX2015 at 1 (“Gatorade is a shelf stable product, not a perishable product like milk or juice.”). To the extent Gatorade has any light-blocking functionality, it appears to simply be a result of the aesthetic label design chosen by Gatorade’s manufacturers rather than a functional design choice. Mitchell, on the other hand, is expressly directed to light-blocking labels, EX3002 at Abstract (“The invention relates to an electromagnetic radiation blocking label arrangement...”), and is intended to be used with perishable products such as dairy products, EX3002 at [0005] (“an electromagnetic radiation blocking

label arrangement is used for labelling of a foodstuff container, such as a contain[er] for packaging of dairy products...”). Accordingly, Mitchell and the Gatorade label serve different functional and aesthetic design purposes, and a POSITA would not have been motivated to look to Mitchell to modify the Gatorade label’s layer configuration.

183. **Petitioner’s Third Reason.** I understand that Petitioner contends that “a POSITA would have recognized such construction as promoting light blocking and recyclability.” Pet. at 45; EX1014 ¶ 118. I disagree. Beyond that conclusory statement, Petitioner does not explain how reordering the layers of the Gatorade label would promote either light blocking or recyclability. *See* Pet. at 45-46. Indeed, under Petitioner’s (incorrect) theory, the Gatorade label should already be both recyclable and light blocking. *See* Pet. at 44. I find no credible basis, therefore, to conclude that combining Mitchell (which Petitioner concedes is not recyclable under the ’422 Patent) with a Gatorade label (which is, according to Petitioner, already light blocking and recyclable), would promote light blocking and recyclability in any way. If anything, adding an indisputably non-recyclable label to the mix should undermine the recyclability of the combined apparatus. At base, Petitioner does not explain how reordering the

layers in a label would *improve* the Gatorade label's alleged light blocking capabilities.

184. **Petitioner's Fourth Reason.** I understand that Petitioner contends that a POSITA would have had a motivation to combine because "a POSITA would have recognized such construction as promoting visibility of the label." Pet. at 45. I disagree with both the premise and the conclusion. Neither Petitioner nor Dr. Deible elaborate on this argument. Rather, Petitioner appears to rely solely on the Examiner's comments during prosecution history. EX1014 ¶ 119 ("Indeed, the Examiner notes that such construction 'ensure[s] the printing is visible and provide (sic) a metallic look to the label.'" (quoting EX1002 at 239)). I understand that Dr. Deible, in forming his opinions, "consider[ed] and rel[ied] upon" the Examiner's determination. EX1014 ¶ 112. In my opinion, that reliance, especially with respect to the Gatorade label, is misplaced. Petitioner presents no evidence that the Gatorade label, with its current ordering of layers, presented visibility issues or suggested some desire for a "metallic look." To the contrary, Petitioner contends that the Gatorade label was introduced into the market at least by 2020, was sold in substantial quantities, and is still sold today without any design modifications (other than changes to the substrate and ink vendors). EX1013 ¶ 54; EX2010 at 84:7-85:12. Neither Petitioner

nor Dr. Deible explain why a POSITA would have desired additional printing visibility or a “metallic look” on the Gatorade label given its alleged commercial viability and popularity. In my opinion, the Examiner’s comments are therefore not applicable to the Gatorade label.

185. **Petitioner’s Fifth Reason.** I understand that Petitioner contends that a POSITA would have had a motivation to combine because the proposed combination would require “only a very minor modification of the Gatorade label” and that “no additional structures need to be added or removed from the Gatorade Label.” Pet. at 45; EX1014 ¶ 120. I disagree with the characterization that the proposed combination is a “very minor modification” of the Gatorade label. As I discuss below, there are practical reasons why a POSITA would have refrained from structuring the layers in the way that Petitioner proposes and Petitioner fails to acknowledge that the proposed layer ordering can have a significant impact on its performance and functionality as a recyclable, light-blocking label.

186. In my opinion, Petitioner also has not shown that a POSITA would have been motivated to modify the Gatorade label specifically—Petitioner does not offer any evidence that there was any need to reorder the layers in the Gatorade label. The Gatorade label’s design, including its ordering of layers, is dictated by commercial needs. EX2010 at 136:14-

137:8. In my view, a POSITA would not have been motivated to change the order of layers in the Gatorade label. The Gatorade label was already included in a commercialized product, which was introduced in 2020, allegedly sold in substantial quantities, and continues to be sold today without any design changes. *See* Pet. at 14 (citing EX1013 ¶¶ 54-55); EX2010 at 84:13-85:12.

187. **Petitioner’s Sixth Reason.** I understand that Petitioner and Dr. Deible contend that the Gatorade label and Mitchell are “similar in purpose, composition, and structure.” EX1014 ¶ 111. I disagree. In my opinion, the Gatorade label and Mitchell have little to no similarity in purpose, composition, and structure, much less similarity enough that a POSITA would have been motivated to combine the Gatorade label and Mitchell as Petitioner contends.

188. As I discussed above, in my opinion, the Gatorade label and Mitchell are not similar in purpose. I also disagree that the Gatorade label and Mitchell are similar in composition or structure. Petitioner appears to contend that the Gatorade label and Mitchell are similar in composition and structure because both labels purportedly comprise “an indicia layer, a high opacity layer, and a light-blocking layer, in close proximity to each other.” *See* Pet. at 46; *see also id.* (citing EX1013 ¶¶ 40-41, 47-48; EX1014 ¶¶ 42-

43, 49-50) (contending that the Gatorade label and Mitchell are structurally similar because the “layers ... are similar, including with their locations with respect to each other”). In my opinion, Petitioner’s argument that the Gatorade label and Mitchell are compositionally, structurally similar can be potentially interpreted in two ways, neither of which I find convincing.

189. First, if Petitioner’s point is that the labels are compositionally or structurally similar because the Gatorade label and Mitchell comprise the same three layers, I do not believe that proposition is adequately evidenced by the record. As I discussed above, neither Petitioner nor Dr. Deible have adequately identified what they deem as the indicia, high opacity, and light-blocking layers. *See supra* § IX.A.3. I do not believe that the Gatorade label has an indicia layer separate from any alleged opacity or light-blocking layers. I also do not agree that the labels are similar in structure simply because the layers’ “locations with respect to each other” are “similar.” Pet. at 46. Petitioner does not elaborate on how the layers’ proximity and locations suggest that the two labels are similar in structure.

190. Second, if Petitioner’s point is that the layers are compositionally or structurally similar because the layers in both labels are physically close to other layers in the label, I understand that to be a baseline expectation for layers in a shrink wrap label. The crux is that claim 4

teaches a specific *ordering* of the layers. It is irrelevant to the motivation-to-combine inquiry, in my opinion, that the layers in the Gatorade label and Mitchell are physically close. The question is whether a POSITA would be motivated to make the change given the design characteristics of the Gatorade label. As I have explained, in my opinion a POSITA would not have had any such motivation.

191. **Petitioner's Seventh Reason.** I understand that Petitioner also contends that "a POSITA would have been prompted to modify the Gatorade Label because doing so was the application of known techniques (e.g., label manufacturing and adjustment of label layers) to a known device (e.g., the Gatorade Label) for improvement to yield predictable results (e.g., a heat shrink label with light blocking capabilities and for a light blocking purpose, and ensuring the printing is visible and providing a metallic look to the label)." Pet. at 46-47; EX1014 ¶ 122. As I discussed above, Petitioner has adduced no evidence suggesting that the Gatorade label needed additional light-blocking capabilities, visibility, or a metallic look. It is irrelevant how practically easy a modification would have been to a POSITA if that POSITA would not have been motivated to implement that modification. Moreover, with respect to visibility and a metallic look, Petitioner's only argument appears to recite the Examiner's comments during prosecution,

which have little to no applicability here, as I discussed above; the evidence in the record suggests that the Gatorade label did not need additional visibility or a metallic look.

192. In addition, neither Petitioner nor Dr. Deible identify any *improvement* that would occur as a result of changing the ordering of the layers. To the contrary, Petitioner appears to merely contend that changing the order *would not detract* from the Gatorade label's visibility. EX2011 at 240:22-241:2 (Q. I'm simply trying to understand your opinion in paragraph 119. A. So if you flip the layers, the label's *still visible*. Q. Okay. It is not *more* visible? A. *It doesn't say that.*"). Accordingly, Petitioner provides no evidence that a POSITA would have been motivated to modify the Gatorade label in order to make any improvements, especially in light of the Gatorade label's alleged commercial success.

4. Petitioner Has Not Shown a Reasonable Expectation of Success

193. In my opinion, Petitioner has also not shown that a POSITA would have had a reasonable expectation of success in modifying the layer configuration of the Gatorade label. Petitioner's only express argument that there would have been a reasonable expectation of success is that "no additional layers are required and only a minor adjustment to label layers is required." Pet. at 46-47; EX1014 ¶ 122.

194. Petitioner and Dr. Deible's analysis appear to equate manufacturing ease and capability with a reasonable expectation of success but fail to analyze whether changing the ordering of the layers would have any impact on the overall functionality of the label and whether it would still meet all the other limitations required by claim 4. As I explain below, it is my opinion that changing the order of the layers would not achieve a predictable result, would detract from the functionality, and would likely impact whether the label would meet all of the claim limitations required by claim 4.

195. First, Mitchell is not intended to be recycled, and so its label design—including its arrangement of layers—is not designed with recyclability in mind. In my opinion, reordering the layers would impact the aesthetics and the brand image of the Gatorade label, as well as its functionality.

196. Second, even if true that a POSTIA could change the order of ink layers by changing the printing process as Petitioner contends, Petitioner and Dr. Deible provide no analysis as to whether such a change would impact the functionality of the label, such as recyclability or light-blocking ability.

197. I understand that as a dependent claim, claim 4 includes all the limitations of the claims from which it depends. As such, claim 4 incorporates all the claim limitations of claims 1 and 3. EX1001 at cl. 4 (depending from claim 3, which further depends from claim 1). Claim 1 requires that the label “block at least 80% of incident light having wavelengths in a range of 200 nm to 900 nm” and that “is recyclable with a PET container.” EX1001 at cl. 1. As Dr. Reitman’s testing shows, the Gatorade label’s inks do not wash off during a caustic wash. Regardless, Petitioner provides no analysis to show how reordering the layers would potentially impact the ability of the ink to wash off as required by claim 4. For example, even assuming any of the inks can be washed off the label (which Petitioner has not shown), if the silver ink itself cannot wash off the label, reordering the silver ink outside of the high opacity and indicia layers could lead to a label in which the silver ink shields the layers underneath such that none of the ink can be washed off. It may be that changing the layer order would further undercut the ability to wash the ink off the label and further detract from its recyclability. Petitioner fails to even acknowledge or address this question. I have reviewed Dr. Deible’s deposition and note that he confirmed that he never considered whether reordering the layers of the Gatorade label would have any impact on any

other claim limitation required by claim 4, including whether doing so would further undermine the washability of the ink. *See* EX2011 at 227:15-24. Thus, a POSITA would not have had a reasonable expectation of success in modifying the layer order while still resulting in a recyclable, light-blocking shrink label.

198. Similarly, Petitioner fails to address whether changing the layer order would impact any alleged light-blocking capabilities of the Gatorade label. Petitioner itself has documented, however, that layer order can dramatically alter the functionality of the labels, including transmittance for light blocking purposes. For example, United States Patent Application No. 2025/0273094 (“the ’094 Application), filed by Petitioner, analyzes seven different example labels compared to a control label. EX2016 at [0137]. Petitioner analyzes the effects of using different white inks, different metallic inks, and changing the ordering of the layers. EX2016 at [0155-0157]. Petitioner states that “[w]ith respect to the positional relationships between layers in labels made in accordance with principles of the present invention and layers in conventional labels...sample 8 can be compared to any of samples 1-7 to determine the effects of changing the positional relationship between types of layers. To make comparisons between labels that are *identical in terms of materials used*, sample 8 can be compared

directly to sample 7.” EX2016 at [0157]. In reporting the results, Petitioner stated that changing the order of the layers “showed an improvement in a lower max transmittance,” which “was more pronounced at 900nm.” EX2016 at [0162]. Additional differences were noted when comparing sample 7 with sample 8 (i.e., when only the layer order was changed). EX2016 at [0163] (discussing changes in L-values). Table 4, reproduced below, depicts several of these differences. In particular, the percent transmittance of sample 8 was over three times higher than sample 7 simply because the layer order was switched.

TABLE 4

Table 4 compares transmittance values at 200 nm (%), transmittance values at 900 nm (%), L-value, opacity, static COF, and kinetic COF for samples 1-8.

Sample	% T @ 200 nm	% T @ 900 nm	L-Value	Opacity	Static COF	Kinetic COF
1	1.502	0.33	82.57	Pass	0.37	0.25
2	1.524	0.36	81.74	Pass	0.38	0.25
3	1.522	0.49	80.80	Pass	0.40	0.25
4	1.422	0.16	81.75	Pass	0.30	0.19
5	1.670	1.05	83.88	Pass	0.16	0.11
6	1.51	1.588	84.24	Pass	0.17	0.11
7	1.498	0.24	83.52	Pass	0.28	0.20
8	1.552	0.87	78.97	Pass	0.21	0.15

EX2016 at Table 4.

199. In addition, Figures 15G-15H depict the transmittance curve for samples 7 and 8, respectively, and showcase the dramatic difference changing the layer order can have on other claimed functionalities (i.e., light-blocking characteristics). Petitioner and Dr. Deible fail to even

acknowledge this possibility, despite that the '094 Application was filed by Petitioner just one month after filing of the present Petition. EX2016 ('094 Application filed February 24, 2025 and claiming priority back to February 24, 2024); Pet. at 59-61 (filed on January 16, 2025).

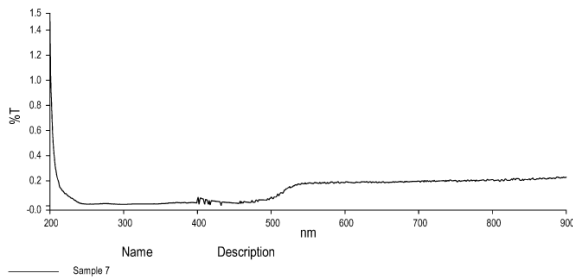


FIG. 15G

EX2016 FIG. 15G

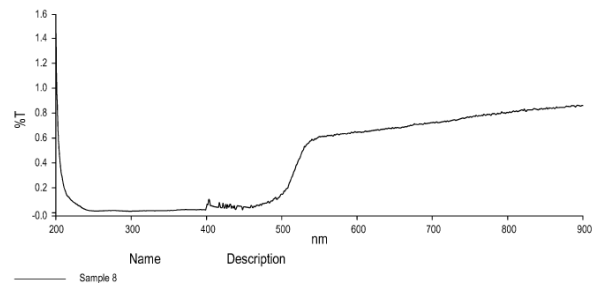


FIG. 15H

EX2016 FIG. 15H

200. Petitioner fails to consider whether modifying the Gatorade label to reorder to layer configuration, to the extent there are any layers that could be reordered, would affect the totality of the claim limitations required by claim 4 and fails to adequately address issues that such a modification would make to the design. Accordingly, Petitioner and Dr. Deible have not shown a reasonable expectation of success in making such a modification.

5. Objective Indicia Cut Against Petitioner's Obviousness Argument

201. Additionally, I understand that objective indicia such as long-felt but unmet needs and industry praise may be relevant to the obviousness

inquiry. Dr. Deible is also aware that secondary considerations are relevant to the obviousness inquiry, EX1014 ¶ 17, however, neither Petitioner nor Dr. Deible discuss any objective indicia. In my opinion, there are several objective indicia, all supported by publicly available material, that undercut Petitioner's argument.

a. Long-Felt but Unmet Need

202. First, in my opinion, objective evidence shows that the '422 Patent met a long-felt but previously unmet need for a light-blocking label that could be recycled with its container without removing the label. *See* EX1001 at 1:26-28. As explained in §IX.B.2 above, prior to the '422 Patent, two things were true. First, the packaged-goods industry sought light-protective packaging to “block [] harmful light waves” from hurting shelf life and product performance. EX1001 at 1:16-20. Second, industry players “globally aspire[d]” to use “recyclable packaging” when possible. EX1001 at 1:14-15. As I explained in §IX.B.2 above, I agree that statements are reflective of the state of the art at the priority date of the '422 Patent.

203. While these general industry forces suggest a need for light blocking shrink films that are recyclable with a container, neither Petitioner nor Dr. Deible offer any analysis for why those broad market forces would have supported (1) a specific motivation to change the ordering of the layers

in the Gatorade label, or (2) why a POSITA would have looked to other labels, including Mitchell, to seek improvements to the Gatorade label's order of layers, when ink design is driven by the brand and the Gatorade label has allegedly been continuously sold since 2020 in significant quantities. EX1013 ¶ 54; EX2010 at 84:13-85:12.

204. The '422 Patent describes the lack of a prior comparable solution. As the '422 Patent discloses, players in the industry traditionally used "color impregnated bottles or containers" or "white shrink films." EX1001 at 1:20-23. But because "[t]he market for recycling color impregnated PET [was] very small," "most of those bottles and containers [were] not recycled." EX1001 at 1:23-25. And sometimes, white shrink films would be printed "without functional light blocking layers." EX1001 at 1:20-23.

205. Additional contemporaneous evidence from the industry confirms the lack of a comprehensive solution that the '422 Patent provided. For example, in April 2024, Nestlé issued a press release announcing its plans to "[m]ake[] [b]ottles [e]asier to [r]ecycle for [c]onsumers." EX2017. The press release discusses Nestlé's efforts to develop the shrink sleeve label for its products. Specifically, Nestlé stated that "[w]hen Nestlé first set out to transition its Nesquik bottles to a recyclable sleeve in 2019, there was no

recyclable solution available in market yet that also leveraged the light-blocking features required for the product.” EX2017 at 2. In my opinion, this shows that there was a longstanding problem for which there was no existing solution.

206. Similarly, an April 2024 article from PackagingDive discusses Nestlé’s plan to use recyclable, light-blocking shrink sleeves on some beverage products. EX2005. As stated in the article, “Shrink sleeves, when they use certain materials, inks and adhesives, can be a common barrier to proper bottle recycling. Problematic label constructions landed on the U.S. Plastics Pact’s list of problematic and unnecessary materials.” EX2005 at 2.

207. This too supports my opinion that, as of the priority date of the ’422 Patent, there was a long-standing need for a recyclable light blocking shrink label for which there was no existing solution.

b. Industry Praise

208. In addition to evidence of a long-standing but unmet need, Patent Owner’s product—a recyclable, light-blocking shrink sleeve—has received significant industry praise and recognition for solving this long-standing problem. In 2024, Patent Owner was awarded the Recycling Packaging category of Packaging Europe’s Sustainability Awards in recognition of Patent Owner’s GreenLabel BlockOut, a light-blocking shrink

label that both blocks up to 99% of light in the 200–900 nm range and is recyclable with a container. EX2019 at 6-7; *see also* EX2020 at 2-4 (interview with Patent Owner as a finalist in the Sustainability Awards 2024); EX2021 (Patent Owner awarded Environmental Category Winner of AWA Sleeve Label Awards for its “innovative packaging solution” that “provides up to 99% light blocking using a clear PET bottle and the Association of Plastic Recyclers (APR) recognized clear PET shrink sleeve, and washable inks.”); EX2022 (US Plastics Pact announcing Patent Owner’s GreenLabel BlockOut among the finalists for 2023 Sustainable Packaging Innovation Award-Recycling); EX2023 (US Plastics Pact announcing Patent Owner’s GreenLabel BlockOut – Recyclable Light-Blocking Shrink Sleeves among the finalists for 2024 Sustainable Packaging Innovation Award-Recycling).

209. In my opinion, the achievement of B+W’s GreenLabel BlockOut is commensurate with the invention of the ’422 Patent—namely, developing a light-blocking label where the light-blocking functionality is provided by a specialized ink layer that washes away during the recycling process, allowing the underlying film to be reclaimed. The fact that these industry accolades were specifically awarded to B+W’s labels that block 99% of light in the 200–900 nm range does not indicate that only this level

of light-blocking was praiseworthy. Indeed, the organizations recognizing B+W's invention were not recognizing inks that achieved a certain level of light blocking per se, but rather were focused on B+W's achievement of developing a light-blocking label where light-blocking inks would wash away, allowing the label to be reclaimed. Several of the awards recognized that B+W's GreenLabel BlockOut solution could be used to block "*up to* 99% of light," indicating that B+W's praiseworthy technology was not merely limited to its highest light-blocking products.

210. Other industry players have also given Patent Owner first-hand praise for its novel label design. For example, Nestlé was a customer of B+W's GreenLabel BlockOut embodying technology, and repeatedly praised this technology in correspondence to B+W. As one example, after being asked about his experience with B+W's "packaging and labels that do not pollute the recycling stream," a Nestle employee closely involved in testing B+W's GreenLabel BlockOut embodying technology commended B+W as "really excel[ing] in being experts in the printing process and com[ing] up with novel solutions there. I have certainly learned a lot in this journey from Andy and appreciate the education element." EX2018. Patent Owner's labels have received industry praise precisely for the unique characteristics at the heart of the '422 Patent. *Compare* EX2019

(sustainability award for recyclable light-blocking shrink label that blocks up to 99% of light); EX2021 (similar), *with* EX1001 at cl. 1 (claiming “heat shrink film,” “light blocking layer...to block 80% of incident light,” “recyclable with a PET container”).

211. In my opinion, Petitioner would have been well aware of this and similar evidence because Petitioner and Patent Owner operate in the same recycling community. Indeed Mr. Bushman acknowledged that Petitioner was aware of and studying Patent Owner’s GreenLabel BlockOut Product in early 2024. EX2010 at 54:10-15, 58:21-59:6 (“I was curious how they – about the product”); 60:19-61:12 (“my primary thought is, at that time, [B+W] promoted their [GreenLabel BlockOut] product as being a light-blocking product in a traditional market solution would be to use a white film... And so I was interested to understand if their product was fully recyclable or recyclable per the APR”), 61:14-62:2 (“it was well known that light-blocking labels are a topic of interest.”).

212. The industry praise garnered by Patent Owner’s GreenLabel BlockOut product (which is a recyclable, light-blocking shrink sleeve label blocking 99% of light in the 200–900 nm range) further supports my opinions that the claimed invention of the ’422 Patent was nonobvious.

c. Copying by Others

213. In addition, MCC's own 2025 patent filings show that it considers recyclable, light-blocking shrink labels to be so novel that it recently sought a patent, Application No. 2025/0273094 ("the '094 Patent"), covering a similar solution. EX2016. For example, claim 1 of the '094 Patent application claims:

1. A light-blocking label, comprising:

A label substrate having a first side and a second side, wherein the first side is configured to be proximate to an article when attached thereto, and wherein the second side is configured to be distal from the article when attached thereto; and

[A] light blocking layer positioned below the label substrate, wherein the light-blocking layer comprised a plurality of metallic flake pigment particles.

EX2016 at cl. 1. The '094 Patent states that "[t]he light-blocking label includes a light-blocking ink layer that may be reverse printed onto the label substrate while other ink layers (e.g., white ink layer, color ink layer) may be surface printed on the label substrate...In some embodiments, the label substrate and article comprise PET and are configured to be collected as recycled PET (i.e., a recyclable light blocking label)." EX2016 at Abstract.

In addition, the '094 Patent states that “[g]enerally speaking, including a light-blocking ink layer 4 will decrease the maximum transmission of light having a wavelength greater than or equal to 200 nm and less than or equal to 900 nm.”). EX2016 at [0093].

214. In addition, I also understand that there is currently litigation ongoing in the Eastern District of Texas, where Patent Owner alleges that Nestlé and its supplier, Fuji Seal International, have copied Patent Owner’s patented light-blocking recyclable shrink labels. EX2024. I understand Patent Owner alleges that Nestlé is infringing certain claims of the '422 Patent by marketing products featuring a recyclable, light-blocking shrink sleeve label. EX2024; EX2025.

215. In my opinion, Petitioner’s similar patent filing and Nestlé’s alleged copying of the '422 Patent invention further support my opinion that the claims of the '422 Patent are nonobvious.

216. Accordingly, in my opinion, evidence of long-felt but unmet needs, industry praise of Patent Owner’s invention, and copying of others in the industry further bolster the nonobviousness of Patent Owner’s invention.

6. Conclusion

217. For all the reasons stated above, it is my opinion that Petitioner has not and cannot show that the Gatorade label combined with the knowledge of a POSITA (including Mitchell) renders obvious claim 4.

C. Ground 3: The Gatorade Label and the Febreze Label Do Not Render Claim 4 Obvious

218. I understand that Petitioner contends that the Gatorade label in combination with the Febreze label render claim 4 obvious. I disagree.

219. Like with Ground 2, Petitioner does not argue that claim 1, from which claim 4 depends, is obvious. With respect to claim 1, Petitioner only argues that the Gatorade label anticipates claim 1. Because claim 4 depends on claim 1, and it is my opinion that the Gatorade label does not meet each and every limitation, it is also my opinion that claim 4 is not obvious because Petitioner has not argued that claim 1 is obvious.

220. In addition, for the reasons stated in §IX.A.3 above, it is my opinion that Petitioner fails to show that there are any distinct “layers” (e.g., “light-blocking layer” or “high opacity layer”) separate from any other ink layer (e.g., “indicia layer”). Therefore, Petitioner cannot show that there are “layers” that can be “adjusted.” Pet. at 49.

221. In my opinion, even assuming Petitioner could show distinct layers, it is my opinion that Ground 3 fails because Petitioner has not shown

a motivation to combine or a reasonable expectation of success in re-ordering the alleged “layers.”² As with Ground 2, Petitioner and Dr. Deible do not make clear which arguments relate to motivation to combine, and which relate to reasonable expectation of success. *See* Pet. at 50-52; EX1014 ¶¶ 132-140. Regardless, neither have merit and I address each inquiry in turn.

² To the extent the Board finds that Petitioner has shown that the Gatorade label consists of ink “layers,” Petitioner fails to show that it would be obvious to modify the Gatorade label as Petitioner contends. I therefore respond to Petitioner’s arguments regarding the order of “layers” in this section. Any reference to “layers” is solely for the purposes of responding to Petitioner’s assertions but is not intended to be construed as an admission that the Gatorade label consists of ink “layers.”

**1. Gatorade Label Combined with the Febreze Label
Does Not Disclose or Render Obvious All Limitations
of Claim 4**

222. I understand Petitioner's only assertion for claims 1 and 3 are anticipation by the Gatorade label alone and that Petitioner raises no argument regarding obviousness of those claims. With respect to claim 4, Petitioner's only obviousness argument relates to the additional limitation present in claim 4 beyond what is claimed in claims 1 and 3. However, I understand that as a dependent claim, claim 4 incorporates the limitations of claims 1 and 3 and adds the additional limitation "wherein the recyclable shrink label comprises an indicia layer and wherein the high opacity layer is disposed between the indicia layer and the light blocking layer." EX1001 at cl. 4. Although Petitioner's analysis under Ground 3 does not even mention claims 1 and 3 or any of the associated limitations, even assuming Petitioner intended to incorporate its prior analysis of those limitations, it does not make any obviousness arguments related to those limitations. Pet. at 47. Instead, Petitioner states that "[i]f the teachings of the Febreze Label was combined with the Gatorade Label, the indicia layer, the high opacity layer, and the light blocking layer would be structured such that the high opacity layer is positioned between the indicia layer and the light blocking layer." Pet. at 53. I therefore understand Petitioner is only providing an

obviousness analysis with respect to the additional limitation in claim 4 related to the order of the layers.

223. Petitioner fails to acknowledge, however, the Patent Office has already considered the Mitchell reference including essentially the same argument during prosecution and PO overcame the Examiner's rejections. EX1002 at 335-37. For example, the Examiner initially rejected PO's claims, including what eventually issued as claim 4, as obvious over Mitchell; a reference that discloses a label with a multi-layer design including a "metallization layer 7 on the second skin layer." EX1002 at 336. Applicant, however, asserted that Mitchell does not teach or disclose a label that is recyclable with a PET container for multiple reasons and amended the claims to include the limitation "wherein the recyclable shrink label is recyclable with a PET container." EX1002 at 316, 335-37. The Examiner agreed and withdrew the rejection based on Mitchell. EX1002 at 357. Petitioner's arguments here—reordering layers such that the high opacity layer is disposed between the indicia layer and light-blocking layer—amount to the same analysis already conducted by the Examiner and should likewise be rejected. As I explain in detail above, it is my opinion that the Gatorade label does not disclose all of the elements of claims 1 and 3 and therefore the Gatorade label, combined with the Febreze label with respect to the order of

any layers, likewise does not disclose all the elements of claim 4 and cannot render the claim obvious.

2. POSITA's Knowledge

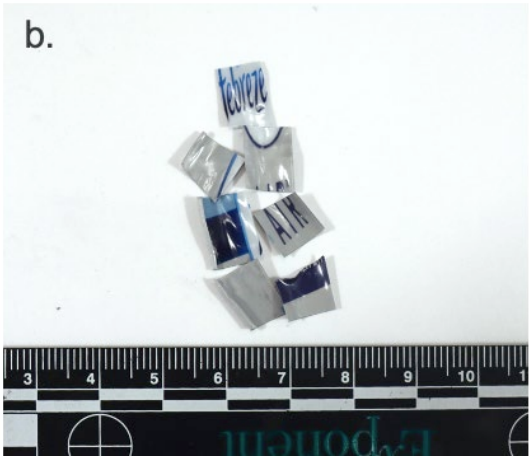
224. As explained in §IX.B.2, above, in my opinion, the state of the art shows a complete lack of knowledge how to design and develop a recyclable, light-blocking shrink label, let alone knowledge of how to modify any ink “layers” while maintaining such properties.

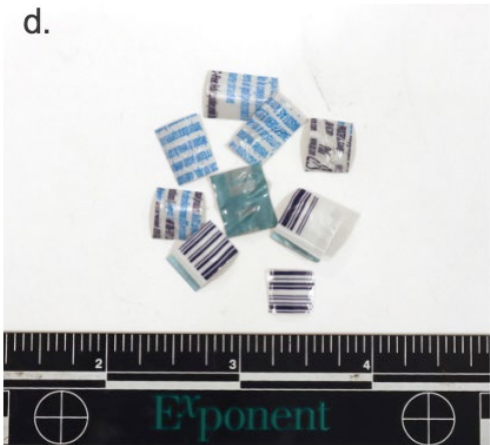
3. Febreze Label is Not Recyclable

225. In my opinion, the Febreze label is not recyclable and therefore would not be considered by a POSITA in order to modify the Gatorade label to result in a recyclable light-blocking label with a particular layer configuration. Mr. Bushman conceded in his deposition that the Febreze label is used on an aerosol can that is not recyclable and the label was not intended to be placed into a recycling stream. EX2010 at 110:12-17. In addition, I have reviewed caustic wash test results obtained by both Dr. Reitman and Dr. Deible, which show significant amounts of ink retained on the film after a caustic wash, supporting my opinion that the Febreze label is not recyclable according to the '422 Patent.

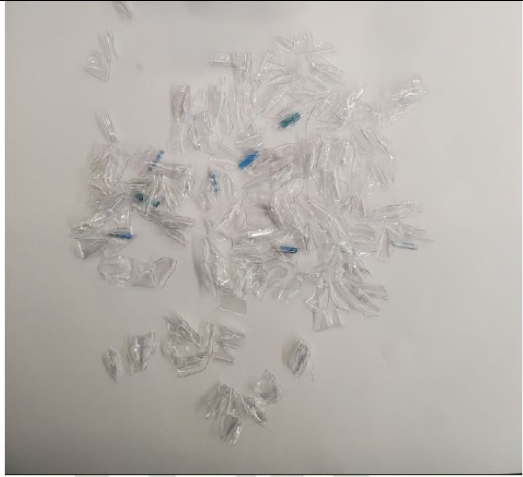
226. I understand Dr. Reitman performed caustic wash testing on the Febreze label using a similar methodology to Dr. Deible's and similar to the

methodology used to test the Gatorade label. EX2012, §VII.A; EX1014 ¶¶ 71-77; §IX.A.1.e. Specifically, Dr. Reitman performed a caustic wash test on samples of preshrunk Febreze labels to determine how much, if any, inks washed off the label. EX2012 ¶¶ 71-73. Similar to the Gatorade label testing, Dr. Reitman preshrunk the labels using two methods: a warm water bath and a hot air gun. EX2012 ¶ 72. Results from both tests confirm that the Febreze label retains significant amounts on ink after the caustic wash, as can be seen in the below before and after images, the only noticeable difference being that the squares curled into tube-shaped objects during the caustic wash.

Before Dr. Reitman’s Caustic Wash	After Dr. Reitman’s Caustic Wash
b.  EX2012 FIG. C13b (water bath preshrunk)	a.  EX2012 FIG. C20a (water bath preshrunk)

Before Dr. Reitman's Caustic Wash	After Dr. Reitman's Caustic Wash
d.  EX2012 FIG. C13d (hot air gun preshrunk)	b.  EX2012 FIG. C20b (hot air gun preshrunk)

227. Likewise, I have reviewed Dr. Deible's results from his caustic wash testing of the Febreze label. EX1014 ¶¶ 71-77, FIGS. 8-11. Dr. Deible's results similarly show significant ink retention on the label. For example, in the images shown below, little if any ink appears to have been removed when comparing the before and after images.

Before Dr. Deible's Caustic Wash	After Dr. Deible's Caustic Wash
 EX1014 at FIG. 9	 EX1014 at FIG. 10

228. In § IX.A.1.e.i.C above, I identified significant criticisms of Dr. Deible's testing protocol, which may have biased his results. Because Dr. Deible followed a similar protocol when testing the Febreze label, those concerns apply to the Febreze label as well. To the extent there is any discrepancy in the test results obtained by Dr. Reitman and Dr. Deible, Dr. Deible's results should be afforded less weight compared to Dr. Reitman, whose testing does not suffer from the same issues.

229. As I explained in § IX.A.1.e above, significant ink retention on a label after a caustic wash leads to contaminants in the recycling stream, therefore, recyclable labels must have inks that wash off such that the underlying resin can be reclaimed as reusable resin.

230. Accordingly, the Febreze label is not recyclable according to the '422 Patent.

4. Petitioner Has Not Shown Any Credible Motivation to Combine

231. It is my opinion that a POSITA would not have had a motivation to modify the Gatorade label in any way let alone combine it with a teaching from the Febreze label. Nor has Petitioner shown any credible motivation to combine the Gatorade label with the Febreze label other than hindsight.

232. Label design is often driven by brands and based on functionality as well as aesthetics. This is confirmed by Mr. Bushman, who testified that label design is dictated by “graphical design intent for the brand.” EX2010 at 136:14-19. Moreover, the ordering of ink “layers” is also dictated by the brand needs, as Mr. Bushman acknowledged. EX2010 at 136:20-22.

233. According to Mr. Bushman, the Gatorade label “was put into commerce at least as early as 2020” and “is very popular and hundreds of millions of labels have been supplied to the market with this label construction.” EX1013 ¶ 55. Mr. Bushman further testified that the Gatorade label relied upon in this case is still being supplied to the market with changes only to the ink suppliers and substrate vendors. EX2010 at

84:17-85:12. Moreover, PepsiCo, Gatorade's manufacturer, acknowledges that Gatorade labels are specifically designed for consumer interaction rather than functionality as a light-blocking label. *See* EX2014 (according to PepsiCo's vice president of research and development, "[g]etting the hue right is critical, since many consumers know products like Gatorade by their color and not necessarily their name"); EX2015 ("Gatorade is a shelf stable product, not a perishable product like milk or juice."). In my opinion, a POSITA would not be motivated to make changes to a brand-specific label that is commercially successful and which was likely designed for a particular customer aesthetic rather than a functional benefit. Nor would a POSITA even necessarily recognize that the Gatorade label had any light-blocking capability. For example, Gatorade is a shelf-stable product whose label does not cover the entire container and features clear portions within the label itself, all of which would convey to a POSITA that the functionality of the label is not intended to prevent light from spoiling or interacting with the contents of the container. Indeed, I understand Dr. Reitman performed transmittance testing on various color regions of the label and determined that the white, clear, and orange regions block less than 20% of light in the 200–900 nm range. EX2012 ¶ 79. Dr. Reitman further quantified that the silver portion of the Gatorade label only accounts for 52-

68% of the total label. EX2012 ¶ 80. And, the Gatorade label does not even cover the entire container. Thus, a POSITA would not have considered the Gatorade label to be functionally light-blocking and would not have been motivated to make changes to the Gatorade label's light-blocking functionalities.

234. Even assuming a POSITA would have had any motivation to modify the Gatorade label or would have even recognized that the Gatorade label had light-blocking functionality, a POSITA would not have looked to teachings from the Febreze label to achieve a recyclable light-blocking shrink label because the Febreze label not recyclable itself, and is not used with a recyclable container. EX2010 at 110:12-17. Instead, the Febreze label is used on an aerosol bottle that cannot be recycled. EX2010 at 110:12-17. Indeed, there is no evidence in the record to show that the Febreze label is even made of PET. I note that the Febreze label supplied to me includes a Recycle Code "7" rather than the Code "1" typically used with PET substrates. Appendix C at FIG 5. A POSITA would not have been motivated to modify a non-recyclable Gatorade label that has no clear intention of being light-blocking using teachings from the Febreze label, which is also not recyclable, in order to somehow achieve a recyclable light-blocking label with a different layer configuration.

235. In my opinion, Petitioner has not shown a motivation to combine the Gatorade and Febreze labels. Like with Ground 2, Petitioner asserts that the Gatorade label and Febreze labels are “similar in purpose, composition, and structure.” Pet. at 52. Petitioner offers seven reasons in support of its argument. *See* Pet. at 50-52; EX1014 ¶¶ 134-140. I find each of these seven reasons unconvincing, as I discuss below.

236. **Petitioner’s First Reason.** I understand that Petitioner contends that “a POSITA would be knowledgeable of both labels, and would know that they serve similar purposes” because (1) “recyclable packaging has been known for decades”; and (2) “the market has required light protective packaging.” Pet. at 50. To the extent that Petitioner is arguing that these dual market forces would have given a POSITA a motivation to combine, I disagree. As I discussed above, Petitioner does not explain how these dual generic market forces would have motivated a POSITA to reorder the layers in the Gatorade label, because there is no indication that the Gatorade label had any problems that would be improved by changing any alleged layers. Under Petitioner’s theory, the Gatorade label was already recyclable and light-blocking. Gatorade is a shelf-stable product that does not require light-blocking to preserve the quality of the underlying product. *See* EX2014 (according to PepsiCo’s vice president of research and

development, “[g]etting the hue right is critical, since many consumers know products like Gatorade by their color and not necessarily their name”); EX2015 (“Gatorade is a shelf stable product, not a perishable product like milk or juice.”). A POSITA would not have been motivated to modify the Gatorade label (covering a non-perishable product) simply because the market understood a need for light-blocking labels for certain products which are negatively affected by light (*e.g.*, dairy products). Moreover, Petitioner concedes that the Gatorade label was sold commercially as early as 2020 in substantial quantities and continues to be sold today with no modifications to the design beyond different suppliers. EX1013 ¶ 54; EX2010 at 84:13-85:12. To the extent Petitioner is arguing that the Gatorade label and Febreze Labels “serve similar purposes,” Pet. at 44-45; EX1014 ¶ 117, I disagree with that statement, as I explain below.

237. I also disagree that the Gatorade and Febreze labels are similar in purpose. Rather, it is my opinion that the two labels were designed for entirely different purposes. First, as Mr. Bushman confirmed during his deposition, the Febreze label is not designed to be recyclable. EX2010 at 110:12-17. Indeed, the Febreze label is affixed to an aerosol can and cannot be recycled. EX2010 at 110:25-111:11. Moreover, even if Petitioner’s argument were correct that the Gatorade label is recyclable, the labels are

dissimilar in purpose where one is purportedly recyclable, and the other is indisputably not.

238. Second, in my opinion, the Gatorade and Febreze labels serve different market segments. The Gatorade label is designed for a non-perishable food product (or to be more specific, a beverage), while the Febreze label is designed for an air freshener. The '422 Patent expressly distinguishes the food market from other markets with shrink label needs. *See* EX1001 at 1:26-28 (“[T]here remains a need for recyclable, light protective packaging options for many markets, including the food and nutraceutical markets.”). In addition, the '422 Patent acknowledges that light blocking is especially targeted for perishable products. EX1001 at 1:16-20 (“The dairy, food, nutraceutical, and other markets also require light protective packaging to block ingredient harmful light waves from impacting shelf life and performance of these products.”). In my opinion, the fact that the Gatorade and Febreze labels serve different markets undercuts Petitioner’s contention that the labels have a similar purpose.

239. **Petitioner’s Second Reason.** I understand that Petitioner contends that a POSITA would have had a motivation to combine because the Gatorade and Febreze labels “were manufactured and sold publicly by the same entity.” Pet. at 50 (citing EX1013 ¶¶ 53-66). As I discussed

above, it is my opinion that the Gatorade and Febreze labels do not serve similar purposes. The fact that these labels were manufactured and sold by the same entity does not alter the analysis. A POSITA would not have a motivation to combine features between two labels intended for vastly different purposes simply because they originate from the same entity and Petitioner offers no analysis to the contrary. Along similar lines, I do not find it convincing that the fact that the Febreze label was a “well-known, publicly sold, product” somehow would motivate a POSITA to combine it with the Gatorade label. Pet. at 51. Petitioner offers no analysis as to why a POSITA would be motivated to specifically modify the Gatorade label in combination specifically with the Febreze label.

240. **Petitioner’s Third Reason.** I understand that Petitioner contends that a POSITA would have been motivated to combine the Gatorade and Febreze labels because it would have “recognized such construction as promoting light blocking and recyclability.” Pet. at 50-51; EX1013 ¶ 136. Like with Ground 2, I disagree. Again, under Petitioner’s theory, the Gatorade label is already both light blocking and recyclable. If Petitioner were correct, a POSITA would have had no motivation to change the order of layers in the Gatorade label and Petitioner offers no explanation as to how reordering the layers would have promoted light blocking needs.

Moreover, as I describe above, the Febreze label is not recyclable. Thus, a POSITA would not look to the Febreze label to “promote light blocking *and recyclability*.” Nor does Petitioner provide any explanation as to how applying the unrecyclable Febreze label’s alleged order of layers would have any impact on the recyclability or light-blocking features. In contrast, Petitioner’s own patent applications show that changing the order of layers can have a significant negative impact on the light blocking functionality, as I explained in §IX.B.4 above. EX2016, [0162].

241. **Petitioner’s Fourth Reason.** I understand that Petitioner contends that “a POSITA would have been motivated to modify the Gatorade Label because the Febreze Label was a well-known, publicly sold, product.” Pet. at 51; EX1013 ¶ 137. I take this argument to mean that the Febreze label’s commercial availability would have spurred a POSITA “to rely upon the teachings” of the Febreze label. Pet. at 51; EX1013 ¶ 137. I disagree. Rather, in my opinion, a POSITA would have recognized that the Febreze label serves a different purpose than the Gatorade label: the Febreze label is not recyclable, and is directed to an entirely different product market. Just because the Febreze label was publicly and commercially available would not have motivated a POSITA to adopt the Febreze label’s

ordering of layers into the Gatorade label and Petitioner fails to explain how modifying the ordering of layers would have improved the Gatorade label.

242. **Petitioner's Fifth Reason.** I understand that Petitioner contends that a POSITA would have had a motivation to combine because the proposed combination would require “only a very minor modification ... of the Gatorade label” and that “no additional structures need to be added or removed from the Gatorade Label.” Pet. at 52; EX1013 ¶ 138. Like with Ground 2, I disagree with the characterization that the proposed combination is a “very minor modification” of the Gatorade label. As I discussed above, there are practical reasons why a POSITA would have refrained from structuring the layers in the way that Petitioner proposes and Petitioner fails to acknowledge that the proposed layer ordering can have a significant impact on its performance and functionality as a recyclable, light blocking label. §IX.B.4; EX2016, [0162]. In addition, Petitioner also does not explain why a POSITA would even make the purportedly “very minor modification” when it has not identified any problems with the Gatorade Label's design.

243. **Petitioner's Sixth Reason.** I understand that Petitioner, like in Ground 2, contends that the Gatorade and Febreze labels are “similar in purpose, composition, and structure.” Pet at 51-52; EX1013 ¶ 139. As I

discussed above, in my opinion, the Gatorade and Febreze label are not similar in purpose or function.

244. Moreover, the Gatorade and Febreze labels are also not similar in composition or structure. Petitioner provides no evidence to show that the Gatorade and Febreze labels are composed of the same polymer (or plastic film). Nor has the Petitioner conclusively identified the composition of the plastic film in either label.

245. Both the Gatorade and Febreze labels' designs are dictated by different brand needs. As I discussed above in Ground 2, a POSITA would not have been motivated to change the Gatorade label—which was already a commercialized product—to rearrange the order of layers. Likewise, a POSITA would not have been motivated to change the Febreze label because neither Petitioner nor Dr. Deible have pointed to any issues with the Gatorade label indicating a need to make such changes or any improvements that would have been achieved by doing so. The Gatorade label's design, including its ordering of purported layers, is dictated by commercial needs and it continues to be sold today without modification to the design. EX2010, 84:13-85:12, 136:14-137:8. In my view, a POSITA would not have been motivated to change the order of layers in the Gatorade label.

246. **Petitioner's Seventh Reason.** I understand that Petitioner also contends that “a POSITA would have been prompted to modify the Gatorade Label because doing so was the application of known techniques (e.g., label manufacturing and adjustment of label layers) to a known device (e.g., the Gatorade Label) for improvement to yield predictable results (e.g., a heat shrink label with light blocking capabilities and for a light blocking purpose).” Pet. at 52; EX1014 ¶ 140. As I discussed above, Petitioner has adduced no evidence suggesting that the Gatorade label needed additional light blocking capabilities. Even if simple to implement, a modification is not necessarily obvious if a POSITA would not have been motivated to implement such modification.

247. Moreover, neither Petitioner nor Dr. Deible identify any *improvement* that would occur as a result of changing the ordering of the layers. To the contrary, Petitioner appears to merely contend that changing the order *would not detract* from the Gatorade label's visibility. EX2011, 240:22-241:2 (Q. I'm simply trying to understand your opinion in paragraph 119? A. If you flip the layers, the label is *still visible*. Q. It is not *more* visible? A. *It doesn't say that.*”). Accordingly, Petitioner provides no evidence that a POSITA would have been motivated to modify the Gatorade

label in order to make any improvements, especially in light of the Gatorade Label's alleged commercial success.

5. Petitioner Has Not Shown a Reasonable Expectation of Success

248. In my opinion, Petitioner has also not shown that a POSITA would have had a reasonable expectation of success in modifying the layer configuration of the Gatorade label. Petitioner's only express argument that there would have been a reasonable expectation of success is that "no additional layers are required and only a minor adjustment to label layers is required." Pet. at 52; EX1014 ¶ 140.

249. Petitioner and Dr. Deible's analysis appear to equate manufacturing ease and capability with a reasonable expectation of success but fail to analyze whether changing the ordering of the layers would have any impact on the overall functionality of the label and whether it would still meet all the other limitations required by claim 4. As I explain below, it is my opinion that changing the order of the layers would not achieve a predictable result, would detract from the functionality, and would likely impact whether the label would meet all of the claim limitations required by claim 4.

250. First, as I discussed above in §VIII, the Febreze label is not intended to be recyclable and so its label design—including its arrangement

of layers—is not designed with recyclability in mind. In my opinion, reordering the layers would impact the aesthetics and the brand image of the Gatorade label, as well as its functionality.

251. Second, even if true that a POSITA could change the order of ink layers by changing the printing process as Petitioner contends, Petitioner and Dr. Deible provide no analysis as to whether such a change would impact the functionality of the label, such as recyclability or light-blocking.

252. I understand that as a dependent claim, claim 4 includes all the limitations of the claims from which it depends. As such, claim 4 incorporates all the claim limitations of claims 1 and 3. EX1001 at cl. 4 (depending from claim 3, which further depends from claim 1). Claim 1 requires that the label “block at least 80% of incident light having wavelengths in a range of 200 nm to 900 nm” and that “is recyclable with a PET container.” EX1001 at cl. 1. As Dr. Reitman’s testing shows, neither the Gatorade label nor the Febreze label feature inks that wash sufficiently off the label substrate during a caustic wash. Regardless, Petitioner provides no analysis to show whether reordering the layers could potentially impact the ability of the ink to wash off as required by claim 4. For example, even assuming any of the inks can be washed off the label (which Petitioner has not shown), if the light blocking ink itself cannot wash off the label,

reordering the light blocking ink outside of the high opacity and indicia layers could lead to a label in which the light blocking ink shields the layers underneath such that none of the ink can be washed off. Petitioner fails to even acknowledge or address this question. It may be that changing the layer order would further undercut the ability to wash the ink off the label and further detract from its recyclability. I have reviewed Dr. Deible's deposition and note that he confirmed that he never considered whether reordering the layers of the Gatorade label would have any impact on any other claim limitation required by claim 4, including whether doing so would further undermine the washability of the ink. EX2011, 227:15-24. Thus, a POSITA would not have a reasonable expectation of success in modifying the layer order while still resulting in a recyclable, light-blocking shrink label.

253. Similarly, Petitioner fails to address whether changing the layer order would impact any alleged light-blocking capabilities of the Gatorade label. Petitioner itself has documented, however, that layer order can dramatically alter the functionality of the labels, including transmittance for light blocking purposes. For example, the '094 Application, filed by Petitioner, analyzes seven different example labels compared to a control label. EX2016 at [0137]. Petitioner analyzes the effects of using different

white inks, different metallic inks, and changing the ordering of the layers. EX2016, [0155-0157]. Petitioner states that “[w]ith respect to the positional relationships between layers in labels made in accordance with principles of the present invention and layers in conventional labels...sample 8 can be compared to any of samples 1-7 to determine the effects of changing the positional relationships between types of layers. To make comparisons between labels that are *identical in terms of materials used*, sample 8 can be compared directly to sample 7.” EX2016, [0157]. In reporting the results, Petitioner stated that changing the order of the layers “showed an improvement in a lower max transmittance,” which “was more pronounced at 900nm.” EX2016, [0162]. Additional differences were noted when comparing sample 7 with sample 8 (i.e., when only the layer order was changed). EX2016, [0163] (discussing changes in L-values). Table 4, reproduced below, depicts several of these differences. In particular, the percent transmittance of sample 8 was over three times higher than sample 7 simply because the layer order was switched.

TABLE 4

Table 4 compares transmittance values at 200 nm (%), transmittance values at 900 nm (%), L-value, opacity, static COF, and kinetic COF for samples 1-8.						
Sample	% T @ 200 nm	% T @ 900 nm	L-Value	Opacity	Static COF	Kinetic COF
1	1.502	0.33	82.57	Pass	0.37	0.25
2	1.524	0.36	81.74	Pass	0.38	0.25
3	1.522	0.49	80.80	Pass	0.40	0.25
4	1.422	0.16	81.75	Pass	0.30	0.19
5	1.670	1.05	83.88	Pass	0.16	0.11
6	1.51	1.588	84.24	Pass	0.17	0.11
7	1.498	0.24	83.52	Pass	0.28	0.20
8	1.552	0.87	78.97	Pass	0.21	0.15

EX2016, Table 4.

254. In addition, Figures 15G-15H depict the transmittance curve for samples 7 and 8, respectively, and showcase the dramatic difference changing the layer order can have on other claimed functionalities (i.e., light blocking characteristics). Petitioner and Dr. Deible fail to even acknowledge this possibility, despite that the '094 Application was filed by Petitioner just one month after filing of the present Petition. EX2016 ('094 Application filed February 24, 2025 and claiming priority back to February 23, 2024); Pet. at 59 (filed on January 16, 2025).

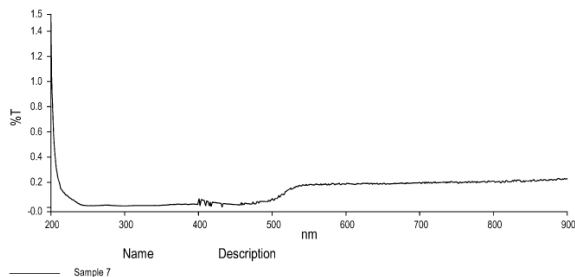


FIG. 15G

EX2016 at FIG. 15G

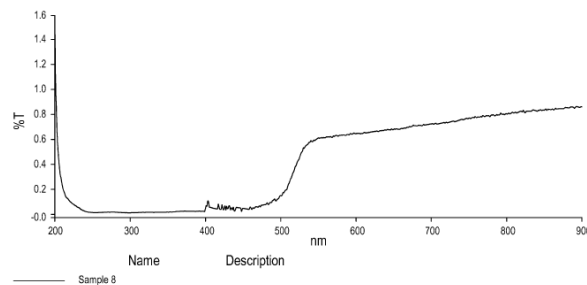


FIG. 15H

EX2016 at FIG. 15H

255. Petitioner fails to consider whether modifying the Gatorade label to reorder the layer configuration, to the extent there are any layers that could be reordered, would affect the totality of the claim limitations required by claim 4 and fails to adequately address issues that such a modification would make to the design. Accordingly, Petitioner and Dr. Deible have not shown a reasonable expectation of success in making such a modification.

6. Secondary Considerations Cut Against Petitioner's Argument

256. Like for Ground 2, objective indicia, including evidence of long-felt but unmet need, industry praise, and copying of others in the industry all further bolster my opinion of nonobviousness. *See supra* § IX.B.5.

7. Conclusion

257. For all the reasons stated above, it is my opinion that Petitioner has not and cannot show that the Gatorade label combined with the Febreze label renders obvious claim 4.

D. Ground 4: The Claims of the '422 Patent Are Not Indefinite

258. I understand that Petitioner contends that the claims of the '422 patent are indefinite. I disagree. In my opinion the claims, together with the specification and the prosecution history are sufficiently clear that a POSITA would be able to reasonably ascertain the scope of the claims.

1. Claim Construction

259. As a preliminary matter, I note that Petitioners do not advance any specific construction for the term “recyclable” or for the term “wherein the recyclable shrink label is recyclable with a PET container.” Pet. At 12-13; EX1013 ¶¶ 21-22; EX1014 ¶¶ 21-22. As such, Petitioner, Dr. Deible, and Mr. Bushman assert that the terms of the patent are understood “in accordance with the ordinary and customary meaning of such claim as understood by a person of ordinary skill in the art.” EX1013 ¶ 21; EX1014 ¶ 21. Under this understanding of the claims in accordance with the ordinary and customary meaning, Petitioner and its expert were able to apply prior art to the claims to arrive at an opinion on whether the prior art discloses a

“recyclable shrink label that is recyclable with a PET container.” EX.1014 ¶¶ 71-79. While I disagree with Dr. Deible’s analysis and conclusions, the fact that he was able to make such a determination applying the ordinary and customary meaning of the claim terms supports my opinion that the claims are sufficiently definite that a POSITA would be able to reasonably ascertain the scope of the claims.

260. As explained in §VII, above, as well as in §IX.D.1 below, I understand Patent Owner proposes a construction for the term “recyclable” to mean “capable of being recycled without removing the label from a container before or during the recycling process.” Paper 8 at 12. In my opinion, Patent Owner’s proposed construction is consistent with the specification and prosecution history. It is further my opinion, as I explain below, that Patent Owner’s proposed construction is consistent with and informs a POSITA’s understanding of the ordinary and customary meaning of the claims in view of the specification’s disclosure of providing a label that is recycled “*with* a PET container.” EX1001 at cl. 1.

2. Prosecution History

261. The ’422 Patent specification provides important context for a POSITA to understand the scope of the claims. For example, the Background section of the specification indicates that “[t]he consumer

packaged-goods markets globally aspire to utilize recyclable packaging for most products.” EX1001 at 1:14-15. For applications where light blocking labels are useful to prevent negative impact on contents within the container, the specification states that “[t]raditionally, color impregnated bottles or containers, and/or white shrink films printed with or sometimes without functional light blocking layers are used to block the harmful light waves” but “[t]he market for recycling color impregnated PET is very small and most of those bottles and container are not recycled.” EX1001 at 1:20-25. Therefore, the ’422 Patent provides for recyclable light blocking shrink labels that can be washed “to remove inks and pigments from the recyclable shrink label” such that “[t]he washed article may be clear and not be stained by the light blocking component or other pigments or inks” and can be “recovered and processed into reusable resin.” EX1001 at 2:53-61.

262. As explained in §VII above, during the prosecution of the ’422 patent, I understand that Patent Owner distinguished the Mitchell prior art reference because Mitchell disclosed a label that is removed from the container prior to or during the recycling process such that the label is not recycled with the container. EX1002 at 335. Patent Owner explained “[t]he term ‘recyclable’ does further limit the claim in that the claimed label **must be capable of being recycled.**” EX1002 at 335 (emphasis in original).

According to Patent Owner “[n]ot all combinations of shrink films and light blocking materials are capable of being recycled.” EX1002 at 335. Therefore, Patent Owner states “[i]t should also be noted that removing the label before or during the recycling process is not evidence of the recyclability of the label. If anything, the desire to provide a removable label implies that the label may not be recyclable and must be removed before the container itself can be recycled. Removing the label during the recycling process is not equivalent to actually recycling the label.” EX1002 at 335.

263. Patent Owner’s statements in the prosecution history are consistent with my understanding of the recycling process and my experience with recyclable labels. For example, labels can be deemed compatible with recycling if (1) the label is removable from the recycling stream and does not otherwise impede the recycling stream (e.g., by inks bleeding into the wash water), or (2) if the label remains in the recycling stream and is capable of being recovered as reusable resin at the end of the recycling stream. Patent Owner’s statements distinguishing prior art that teaches removal of a label prior to or during the recycling stream, therefore, are consistent with the ’422 Patent’s goal of recycling a label *with* the container.

3. '422 Specification Consistently Defines the Scope of the Claims

264. Viewed in light of the prosecution history and the nature of the recycling process, the statements in the specification describing the term “recyclable” are therefore internally consistent with one another and the goal of providing a label that is recyclable *with* a container. Contrary to Petitioner and Mr. Bushman’s assertions, the specification describes that a label is recyclable if the inks on the layers are designed to wash off the underlying film substrate such that the label can remain in the recycling stream and be recovered with other resins in the recycling stream to form reusable resin. E.g., EX1001 at 20:17-20 (“during the recycling process, the inks and coating layers cleanly separate from the heat shrink film, allowing pure resin to be recovered and processed into reusable resin.”).

265. Petitioner states that “the ’422 patent defines what makes a shrink label recyclable, but does so in several disparate ways.” Pet. at 54. Petitioner lists several passages from the ’422 patent that Petitioner asserts are inconsistent, including:

1. “Generally clear crystallizable heat shrink films (e.g., PET shrink films) are considered recyclable if no inks are retained on the film after a caustic wash cycle typically used in PET reclaiming processes.” EX1001 at 6:61-65
2. “According to an embodiment, the inks utilized in the labels of the present disclosure, including the light blocking inks, are

designed to wash off the film during a reclaiming process allowing the labels and containers they cover to be recycled.” EX1001, at 7:9-13.

3. “According to an embodiment, the labels of the present disclosure can meet certain industry standards, including for example the Association for Plastic Recyclers (APR) Critical Guidance Protocol for Clear PET Articles with Labels and Closures (PET-CG-02), which can be considered as certifying that the film is fully recyclable with the container or bottle.” EX1001, at 11:29-53.
4. “In some embodiments, the labels of the present disclosure are recyclable according to Evaluation of the Near Infrared (NIR) Sorting Potential of a Whole Plastic Article (SORT-B-01), Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized or Metallic Printed Components (SORT-B-03), or both.” EX1001, at 11:29-53.
5. “That is, according to an embodiment, the labels of the present disclosure are fully recyclable.” EX1001, at 11:29-53.
6. “For example, the labels may include inks that can be washed off in a typical PET recycling wash (caustic wash) and the polymers used in the labels are preferably clear (preferably clear PET).” EX1001, at 11:29-53.
7. “According to an embodiment, the labels are free or substantially free of inks that cannot be washed off in a caustic wash.” EX1001, at 11:29-53.
8. “According to an embodiment, the labels are free or substantially free of colored plastics (including white plastics) that cannot be recycled.” EX1001, at 11:29-53.
9. “[I]n connection with the prosecution of the application that issued as the ‘422 patent, Applicant argued over the prior art that “[e]ven if the label in Mitchell ‘879 was otherwise capable of being recycled, the pigments being incorporated into the core layer polymer would contaminate the polymer flake during the recycling process...[i]n contrast, the present application teaches that the inks and pigments used in the recyclable shrink label may be removed by washing, leaving behind a label that can be recycled with the article.” EX1002, at 337.

266. But these statements are entirely consistent with one another and consistent with the claims of the '422 patent, which require that a “recyclable shrink label is recyclable *with* a PET container.” EX1001, cls. 1, 19. Furthermore, from the perspective of a POSITA, these statements make clear, rather than introduce confusion, the scope of the claims in light of the specification and prosecution history. I discuss each of the statements below.

267. First, Petitioner cites the statement “[g]enerally clear crystallizable heat shrink films (e.g., PET shrink films) are considered recyclable if no inks are retained on the film after a caustic wash cycle typically used in PET reclaiming processes.” EX1001 at 6:61-65. In my opinion, a POSITA would understand that, consistent with the goal of the '422 patent to be able to recycle both the label and the container together without removing the label prior to or during the recycling process, this disclosure from the specification explains that the term “recyclable” within the context of the '422 patent requires that the label resin can be reclaimed during recycling with a PET container. A POSITA would have known that recyclability is hindered by inks that cannot be washed off of the label resin and therefore contaminate the reclaimed PET. This is consistent with my experience in the recycling industry as well. In order to reclaim the plastic

resin at the end of the recycling process, a POSITA, who would be familiar with APR protocols such as PET-CG-02 (EX1027), would understand that if ink cannot be removed from the label resin, it may contaminate the reclaimed PET. This was a well-known problem in the art and a common consideration in the recyclability of materials.

268. Second, Petitioner points to the statement “[a]ccording to an embodiment, the inks utilized in the labels of the present disclosure, including the light blocking inks, are designed to wash off the film during a reclaiming process allowing the labels and containers they cover to be recycled.” EX1001 at 7:9-13. As explained above, this statement is entirely consistent with my experience in the recycling industry and with the goal of the ’422 patent to claim a label that can be recycled with a container. A POSITA would have understood that this statement refers to a label that is intended to enter the recycling stream with a container and continue through the recycling stream to be reclaimed as reusable resin at the end.

269. Petitioner further cites the statement “[a]ccording to an embodiment, the labels are free or substantially free of inks that cannot be washed off in a caustic wash.” EX1001 at 11:29-53. This too is consistent with the understanding that in order for a label to be recyclable with a container without being removed from the recycling stream, the label must

be designed such that the inks wash off the label and do not contaminate the reclaimed resin. I also note that the patent explicitly defines the term “substantially” such that the term “can be understood to modify the term that follows by at least 90%, at least about 95%, or at least about 98%.” EX1001 at 3:34-37. To the extent Petitioner asserts that a POSITA would not understand what constitutes substantially free of inks that cannot be washed off as compared to free of inks that cannot be washed off, I disagree. The specification’s definition of “substantially” provides clear guidance to a POSITA as to the extent of inks that can remain on the film.

270. In his deposition, Mr. Bushman testified that the term “substantially” is an ambiguous term and therefore renders the claim indefinite. EX2010, at 195:2-11. However, he also testified that “if there is a definition [of the term ‘substantially’]...that would change your opinion as to whether or not that particular sentence renders the claims indefinite.” EX2010 at 195:18-196:1 (“Yes, I think that this – that would help with understanding what recyclable means, but it wouldn’t define the completeness of the term recyclable.”). It is apparent from Mr. Bushman’s testimony that he did not consider that the ’422 patent *does* define the term “substantially.” EX1001 at 3:34-37. In my opinion, the definition for the term “substantially” not only informs a POSITA as to the scope of the

claims but is consistent with a POSITA's understanding that the claims do not require that exactly 100% of all inks must be washed off of the labels, but that the labels are designed such that they are substantially free of inks that do not wash off.

271. Petitioner also cites the statement “[f]or example, the labels may include inks that can be washed off in a typical PET recycling wash (caustic wash) and the polymers used in the labels are preferably clear (preferably clear PET).” EX1001 at 11:29-53. As explained above, a POSITA would understand that this statement is consistent with the other statements above that the labels are designed such that the inks wash off the label during the recycling process, which allows the label to remain in the recycling stream alongside the container in order to be reclaimed as reusable resin. Moreover, the reference in this statement to preferably clear plastics used in the label is consistent with the explanation in the specification that colored plastics are generally lower value and often not recyclable. EX1001 at 1:23-25 (“[t]he market for recycling color impregnated PET is very small and most of those bottles and containers are not recycled.”). Thus, a POSITA would have understood this statement to be consistent with the goal of claiming a label that enters a recycling stream with a container and remains in the recycling stream to be reclaimed as reusable resin.

272. Similarly, “[a]ccording to an embodiment, the labels are free or substantially free of colored plastics (including white plastics) that cannot be recycled.” EX1001 at 11:29-53. As explained above, this is consistent with the explanation in the specification that colored plastics are generally lower value and often not recyclable. EX1001 at 1:23-25 (“[t]he market for recycling color impregnated PET is very small and most of those bottles and containers are not recycled.”). Thus, a POSITA would have understood this statement to be consistent with having a label that enters a recycling stream with a container and remains in the recycling stream to be reclaimed as reusable resin.

273. Petitioner also points to the specification’s statement that “according to an embodiment, the labels of the present disclosure are fully recyclable.” EX1001 at 11:29-53. Petitioner states that this creates ambiguity because “it is undeterminable whether to fall within the scope of this claim term the labels need be recyclable or fully recyclable, or whether there is a difference between the two.” Pet. at 58. It is my understanding that the claims of a patent are not limited to any particular embodiment, which are mere examples of the claimed invention. As described in the specification, a label may be “fully recyclable,” meaning the label resin in that embodiment can be fully reclaimed with other PET resin during

recycling. Providing this embodiment does not introduce confusion into the term “recyclable” and instead provides an example where the label resins are fully reclaimed. Accordingly, a POSITA would find no confusion in the use of the terms “recyclable” or “fully recyclable” within this context. I further note that Petitioner, Mr. Bushman, and Dr. Deible all rely on documents that use the term “fully recyclable” as evidence of the Gatorade label meeting the claims of the ’422 patent without raising any issue as to the meaning of the term. *See* EX1016 (“fully recyclable”); Pet. at 31 (citing EX1016 to show recyclability of Gatorade label); EX1013 ¶ 56 (same); EX1014 ¶78 (same). In fact, at his deposition, Mr. Bushman freely used the term “fully recyclable.” EX2010 at 112:25-113:17 (“Q...Therefore, it’s certified fully recyclable, right? A: Yes. Q: What does that mean to you? A: Yes. Exactly what it says. Q: Well, can you explain? What does that mean? A: It means that they have completed testing under the APR Critical Guidance method... Q: And so what does it mean that its certified fully recyclable? A: They are using the APR guidance as a statement of recyclability.”).

274. Each of these statements is entirely consistent with a POSITA’s understanding of the scope of the claims in light of the specification and prosecution history. In my opinion, in light of the specification and

prosecution history, the scope of the '422 Patent claims is reasonably ascertainable.

275. Petitioner next cites statements in the specification relating recyclability to APR guidance documents. For example, Petitioner cites the statement “According to an embodiment, the labels of the present disclosure can meet certain industry standards, including for example the Association for Plastic Recyclers (APR) Critical Guidance Protocol for Clear PET Articles with Labels and Closures (PET-CG-02), which can be considered as certifying that the film is fully recyclable with the container or bottle.” EX1001 at 11:29-53. In addition, Petitioner cites the statements “In some embodiments, the labels of the present disclosure are recyclable according to Evaluation of the Near Infrared (NIR) Sorting Potential of a Whole Plastic Article (SORT-B-01), Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized or Metallic Printed Components (SORT-B-03), or both.” EX1001 at 11:29-53. As explained in more detail below, these too are entirely consistent with and inform a POSITA of the scope of the '422 patent claims as requiring a label that is able to enter and remain in a recycling stream and be reclaimed as reusable resin. A POSITA would have been well aware that the APR provides guidance to industry members to facilitate laboratory testing to confirm recyclability of materials. While it is

not the only test for recyclability, APR guidance documents form a framework for label and container manufacturers to follow to develop data in an effort to obtain certification of recyclability from APR, an objective third party organization that is focused on improving recycling of plastics. As Mr. Bushman, Petitioner's former Vice President of Global R&D, acknowledged, POSITAs rely on APR guidance and certification to design packaging and ensure that a particular article is recyclable. EX2010 at 156:13-157:3.

276. In my experience, industry players seeking to make products that feature recyclable labels also rely on APR certification and guidance documents to demonstrate that a particular label design is recyclable. This is supported by the fact that companies like Brook + Whittle and MCC advertise their APR certifications. *See* EX2034; EX2035; EX1018.

4. APR Guidance and Testing

277. Petitioner cites to several APR guidance documents referred to in the '422 patent specification and argues that the guidance documents provide "disparate" definitions of recyclability. Pet. At 54-55. I disagree. In my opinion, the APR guidance documents provide examples of well-known tests that can be used to establish that an article is recyclable. These guidance documents include the APR Critical Guidance Protocol for Clear

PET Articles with Labels and Closures (PET-CG-02), the Evaluation of the Near Infrared (NIR) Sorting Potential of a Whole Plastic Article (SORT-B-01), and the Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized or Metallic Printed Components (SORT-B-03). Pet. At 54-55. These APR guidance documents are complementary and can be used for guidance when creating a recyclable label. A POSITA would have been familiar with these guidance documents, how and when they can be used, and how they interact with one another. I discuss each of the cited APR guidance documents below.

a. APR Critical Guidance

278. Petitioner points to the statement in the specification that states “[a]ccording to an embodiment, the labels of the present disclosure can meet certain industry standards, including for example the Association for Plastic Recyclers (APR) Critical Guidance Protocol for Clear PET Articles with Labels and Closures (PET-CG-02), which can be considered as certifying that the film is fully recyclable with the container or bottle.” EX1001, at 11:29-53. Petitioner further states that “it could be interpreted that, to fall within the scope of this claim term, no inks must remain on the film after a caustic wash cycle typically used in PET reclaiming processes, or it could be that to fall within the scope of this claim term, inks only need to be designed

to wash off the film during a reclaiming process allowing the labels and containers they cover to be recycled, or it could be that to fall within the scope of this claim term, the Association for Plastic Recyclers (APR) Critical Guidance Protocol for Clear PET Articles with Labels and Closures (PET-CG-02) must be complied with.” Pet. At 57. In view of the specification and prosecution history, each of these statements are consistent with one another and inform a POSITA as to the scope of the claims.

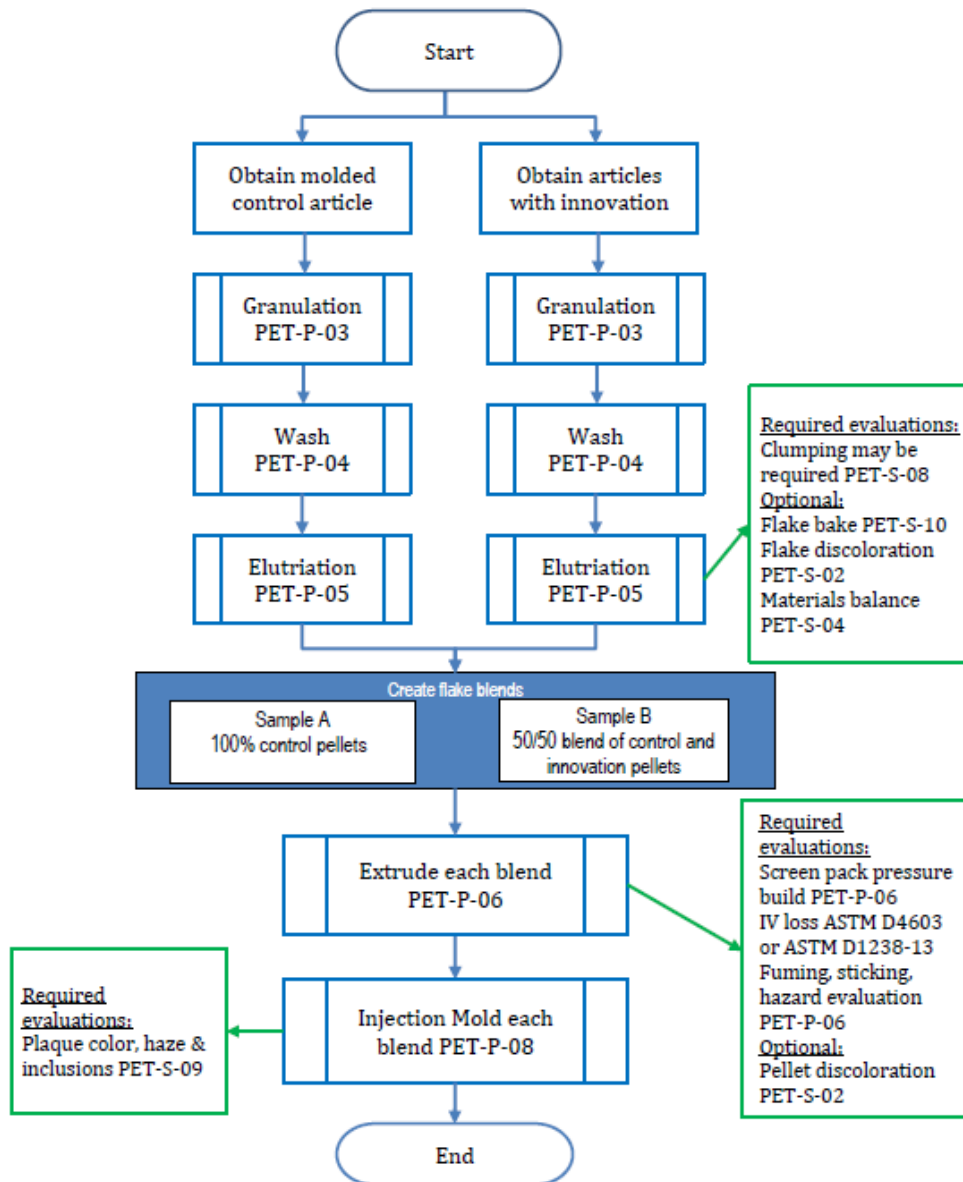
279. The APR Critical Guidance Protocol states that “[t]his is a comprehensive laboratory scale evaluation that can be used to assess the compatibility of PET packaging design features such as labels, closures, dispensers and attachments with common commercial scale recycling processes. This protocol is only applicable to clear PET articles. Product developers, as well as those who specify products, can employ this test to maintain and improve the quality and productivity of PET recycling.” EX1027 at 1.

280. While the APR Critical Guidance provides objective testing parameters to determine whether a particular label is recyclable with a PET container, the guidance notes “[t]he test is not appropriate for package constructions that will not pass through sorting steps at a Materials Recovery Facility and be collected into PET bales for recycling, nor for packages that

are not in alignment with the APR Design Guide for Plastics Recycling text. This test is not appropriate for materials that employ time dependent behavior where appearance or physical properties are expected to change over time. If it is questionable that the test article doesn't meet these criteria, the appropriate APR sorting potential protocol or degradability test should be conducted prior to conducting this test." EX1027 at 1. In addition, the Guidance document states "If there is any concern that the test article will not sort properly in either a materials recovery facility or plastic reclaimer, the applicable APR sortation potential test(s) must be conducted prior to proceeding with the critical guidance test. Criteria for determining this can be found in the APR Design Guide For Plastics Recyclability. Specific factors to consider are small size, more two dimensional than three dimensional, containing metal or metalized inks and material components that could influence NIR sortation." EX1027 at 3.

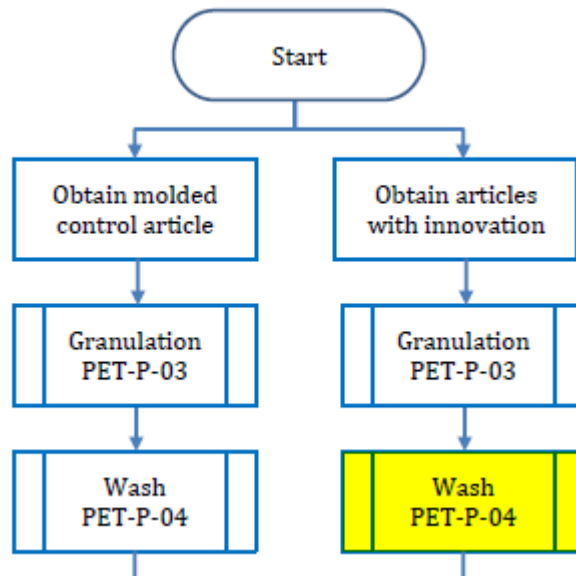
281. Thus, as a starting point, the Critical Guidance document specifies that articles must comply with the sorting requirements, including for articles containing metal or metalized inks or materials that could influence NIR sortation, which the APR provides additional guidance documents to evaluate. These sortation guidance documents are provided as SORT-B-01 and SORT-B-03, described below.

282. The APR Critical Guidance provides the following flow chart to help identify the testing to perform in order to determine whether a label meets APR certification standards.



EX1027 at 7.

283. As relevant to my opinion that the '422 Patent sufficiently describes the scope of the claim terms, the APR Critical Guidance Protocol Flow chart includes a “Wash” test, cited as PET-P-04, in which “PET flake is washed in a hot aqueous caustic, detergent solution.

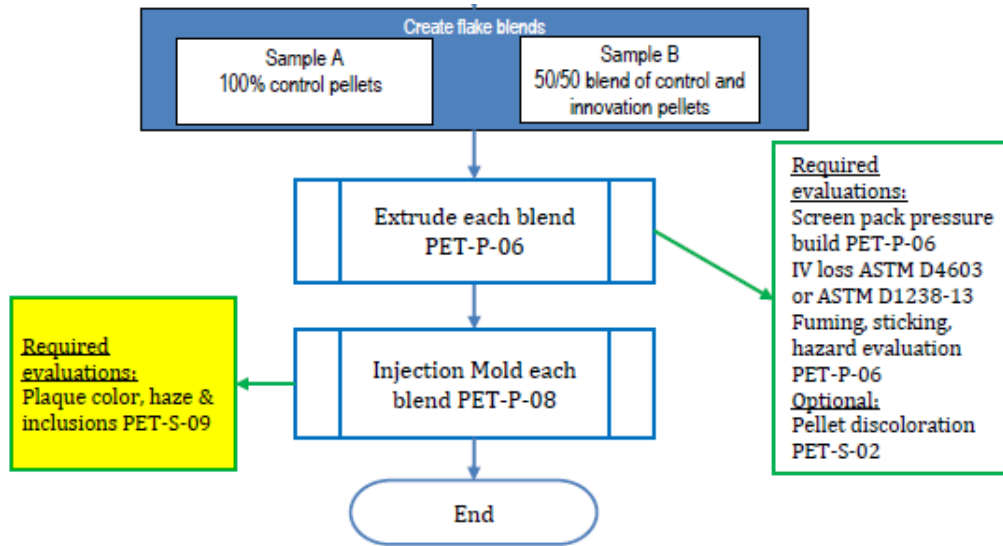


EX1027 at 7 (annotated).

284. The wash step is intended to remove contamination from PET and can contribute to liberating labels, adhesives, coatings, and layers from PET flake.” EX1028 at 9. As I explain in more detail below, the wash test performs two functions related to this analysis: (1) separation and removal from the recycling stream, based on density, of labels that are made of different material than the PET container, and (2) removal of inks from labels made from PET. EX1028 at 9. Consistent with the Patent Owner’s proposed construction that “recyclable” means “capable of being recycled

without removing the label from a container before or during the recycling process,” the APR Critical Guidance Protocol informs a POSITA that the wash test is used to evaluate whether the inks on the label wash off the substrate, which is consistent with the definition of recyclable in the ’422 Patent specification. *See, e.g.,* EX1001 at 6:61-65 (“Generally clear crystallizable heat shrink films (e.g., PET shrink films) are considered recyclable if no inks are retained on the film after a caustic wash cycle typically used in PET reclaiming processes.”).

285. In addition, the APR Critical Guidance provides an objective standard for determining whether the reclaimed resin is sufficiently free of retained inks. For example, the final step in the APR Critical Guidance flow chart describes evaluating “[p]laque color, haze & inclusions.” EX1027 at 7. As I explain in more detail below, this test evaluates whether, and to what extent, there are any retained inks on the label after the wash step. Retained inks, consistent with the descriptions in the ’422 Patent specification, may contaminate the recycling process, rendering the label unrecyclable. I explain each of these steps in more detail below.



EX1027 at 7 (annotated).

b. Sortation Guidance

286. As explained above, APR Critical Guidance explains that when evaluating whether a label is recyclable with a PET container, a preliminary step is to test whether the label includes features which would render the entire article unrecyclable. As the specification explains, there are two guidance documents useful in determining whether the label includes any such features: SORT-B-01 and SORT-B-03. EX1001 at 11:38-44. These guidance documents explain, “The sorting potential tests are intended to identify specific design features that may cause an entire package to be lost in the recycling process. The consequences of a plastic article being mis-sorted prior to size reduction are more significant than in processes that follow size reduction, since the entire package is lost to the plastics recycling

stream rather than a mere component of the package.” EX1010 at 1. Thus, a POSITA would have understood that the references to the sorting guidance documents in the ’422 Patent specification are consistent with the goal of providing a label that can be recycled with a container, which cannot happen if some design aspect of a label causes the entire label-container article to be removed from a recycling stream. I discuss each of the sortation guidance documents below.

287. The first guidance document, Evaluation of the Near Infrared (NIR) Sorting Potential of a Whole Plastic Article (SORT-B-01) explains that “single stream MRFs and PET reclaimers employ automated equipment that sort plastic packaging and other items by their NIR (near infrared) signature, either in transmission or reflection. For this equipment to operate effectively it must accurately identify the plastic article and direct it to the correct location. Otherwise, the article is either directed to the waste stream or becomes a contaminant in another recyclable stream where it is likely to not be recycled.” EX1010 at 1. Accordingly, the SORT-B-01 guidance document “provides a means of evaluating whether a plastic article can be accurately identified and sorted on pilot scale NIR sortation equipment that performs similarly to that used in production facilities.” EX1010 at 1.

288. Similarly, the second guidance document, Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized, or Metallic Printed Components (SORT-B-03), explains that “[m]etal separation before size reduction is conducted at the MRF and plastic reclaimer using three primary technologies,” including magnetism, eddy current, and metal detection. EX1011 at 2. Accordingly, SORT-B-03 “provides a means for evaluating whether a metal containing plastic article will pass correctly through the MRF and plastic reclaimers metal separation process” to determine whether a “specific design feature[] ... may cause an entire package to be lost in the recycling process.” EX1011 at 1-2 (emphasis omitted).

289. Accordingly, a POSITA would have understood that the Sorting Guidance documents cited in the specification provide an exemplary test protocol that was widely known that ensures that label designs do not inadvertently cause an entire article (label and container) to be missorted into a waste stream rather than a recycling stream at a MRF. This is consistent with the claims in light of the specification and prosecution history.

c. Wash Test Guidance

290. For labels that meet the sortation guidance, the APR Critical Guidance protocol provides several tests to determine whether a label is

recyclable under APR standards, including granulation, wash and elutriation. EX1027 at 7. After an article is granulated into flake, the flake is added to a caustic wash bath that is “intended to remove contamination from PET and can contribute to liberating labels, adhesives, coatings and layers from PET flake.” EX1028 at 9. The Guidance provides two tests related to my indefiniteness analysis – the float/sink test and the caustic wash test. I describe each below.

i. Float/Sink Test

291. As part of the Wash test, some labels can be removed from the recycling stream in order to prevent contamination of the recycling stream for the container. For example, PET has a density greater than water and therefore sinks in the water bath. Some labels are made from different polymer resins that have a density less than water and therefore float in the water bath. Since these labels containing other polymer resins may contaminate the recycling stream from the PET container, the floating labels can be removed from the top of the water bath to preserve the recyclability of the container.

292. During the prosecution of the '422 Patent, Patent Owner distinguished prior art that taught removing labels prior to or during the recycling process. EX1002 at 335. Accordingly, the '422 Patent

distinguishes labels that are removed during the float/sink test. Therefore, the relevant portion of the wash test in my opinion is the caustic wash, which I describe below.

ii. Caustic Wash Test Evaluation

293. In addition to the float/sink test, the wash test also includes a caustic wash test that “is intended to remove contamination from PET and can contribute to liberating labels, adhesives, coatings and layers from PET flake.” EX1028 at 9. APR Critical Guidance notes that “[i]nks and adhesives can impact the costs of managing a wash system and waste disposal. Therefore, for innovations involving printing inks or labels with adhesives, it is recommended that the Wash Water Evaluation be conducted.” EX1027 at 2.

294. In my experience, and consistent with the guidance documents, performing a caustic wash test is intended to remove any removable inks from the surface of the polymer flake and test whether any removed inks stain the wash water or polymer flake.

295. Therefore, in my opinion, the APR critical guidance is entirely consistent with the '422 Patent specification description that a label may be recyclable if inks can be removed so that they do not stain the wash water or polymer flake.

d. Plaque Inspection Testing

296. APR also provides an objective standard for determining whether the ink on a particular label sufficiently washes off to meet APR guidance. For example, the APR Critical Guidance Protocol provides “[r]equired evaluations” at the end of the testing process, which tests the injected molded plaques for “[p]laque color, haze & inclusions.” EX1027 at 7 (citing PET-S-09 guidance).

297. The cited PET-S-09 Guidance document provides a procedure for evaluating the color, haze, and inclusions on the injection molded plaques. EX2026. For example, the PET-S-09 guidance states, “When recycling clear PET, it is important that the PET resin, additives, and any other features employed such as labels or closures have the least possible impact on the color and transparency of the resin. Industry experience is that inks, adhesives, additives, layers and coatings, for example, can be sources of color formation and specks in recycled PET.” EX2026 at 1. Accordingly, “[t]his document presents a standard method to evaluate any contribution to color, haze or inclusions that might result from recycling PET articles. The test measures the color and haze values of transparent injection molded plaques. This evaluation is an important part of many APR tests and is used

to measure any impact of a design feature such as labels, inks, adhesives or additives on PET recycling.” EX2026 at 1.

298. The protocol established in PET-S-09 states: (a) “Place the plaque between your eyes and the light source. The approximate distance between plaque and eyes is 30 cm”; and (b) “Count any plaque with one or more black specks and/or inclusions greater than 0.1 mm².” EX2026 at 3. It provides a chart to document the results. EX2026 at 3.

299. The APR Critical Guidance explains how to interpret the inclusion test results to determine whether a label meets APR guidance:

Evaluation of molded plaques

Property	Test method	APR Guidance Preferred values
<u>Required values</u>		
L value of plaques B	Evaluation of PET Plaques for Color, Haze and Inclusions, PET-S-09	>82
a* value of plaques A and B	PET-S-09	Less than 1.5 units difference between plaques A and B
b* value of plaques A and B	PET-S-09	Less than 1.5 units difference between A and B
% haze of plaques A and B	PET-S-09	Control not to exceed 9% value, and test not to exceed more than 10% units greater than control.
Inclusions and specks in plaques T5	PET-S-09	If A = 0; B is 2 or less If A = 1; B is 4 or less If A = 2; B is 6 or less
IV loss when pellets re molded to plaques	ASTM D 4603 solution IV with phenol/tetrachlorethane at 30°, or ASTM D1238 – 13 method B	The value of IV loss for sample B is no greater than 0.025 units when compared to sample A

EX1027 at 6 (annotated).

300. Therefore, in my opinion, the APR critical guidance provides an objective standard test to identify whether labels that are retained in the recycling stream (rather than being removed prior to or during the recycling

process) are reclaimable as reusable polymer resin or inks retained on the film become contaminants in the recycling stream. This, again, is consistent with the '422 Patent's goal that claimed labels are capable of being recycled in a recycling stream without being removed prior to or during the recycling process because the labels contain inks that wash off.

5. Patent Owner Has Already Overcome Similar Indefiniteness Argument During Prosecution and In Litigation

301. As Petitioner noted in its Discretionary Denial Response, a similar claim limitation was included in a related application, Application No. 18/667,667 ("the '677 Application"). EX1026 at 6. For example, claim 38 of the '677 Application claims "wherein the light blocking ink layer is removable in a caustic wash to preserve the recyclability of the container." EX1026 at 6. Although these claims were initially rejected by the examiner as indefinite, Patent Owner successfully overcame the rejection by amending claim 38 to require "wherein the light blocking ink layer is **configured to be** removable in a caustic wash to preserve the recyclability of the container." EX2027 at 10 (emphasis in original). Patent Owner further noted "the MPEP makes clear that '[t]here is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper.'" EX2027 at 11 (citing MPEP §

2173.05(g)). As Patent Owner stated, “it has long been established that a ‘functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step.’” EX2027 at 11.

302. Examiner ultimately agreed with Patent Owner, withdrawing the previous § 112 indefiniteness rejection. EX2028 at 25-26. Examiner noted that “[t]he amendments recite the intended use and/or process of using the claimed label.” EX2028 at 25-26.

303. Therefore, Petitioner’s assertion that the initial rejection by the examiner supports its indefiniteness arguments is unfounded and should be rejected. Paper 9 at 25. Instead, the ’677 prosecution history only bolsters the validity of the ’422 Patent.

304. In addition, a District Court has already construed “recyclable” and its related elements in a manner similar to the construction proffered here by Patent Owner and the Board here, to which the accused infringer stipulated, thereby implicitly rejecting any indefiniteness argument.

EX2037. There can be no doubt that a POSITA understands the meaning of a “recyclable” label.

6. Conclusion

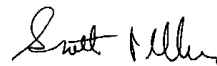
305. Contrary to Petitioner, Dr. Deible, and Mr. Bushman’s analysis, in my opinion the scope of the ’422 Patent claims is clear to a POSITA and confirmed by each of the consistent statements made in the specification and prosecution history. In view of the prosecution history disclaiming labels that are removed prior to or during the recycling process, the ’422 Patent claims labels that are capable of being recycled without removing the label prior to or during the recycling process. This is accomplished through the use of inks that can be washed off during recycling. EX1001 at 20:16-20. A POSITA would have understood in view of the specification how to test whether a label can be recycled with a PET container, including through reference to objective industry guidance documents. The ’422 Patent claims are therefore sufficiently definite.

X. CONCLUSION

306. I currently hold the opinions expressed in this declaration. However, my analysis may be continuing, and I reserve the right to amend this declaration should I acquire additional information and/or attain supplemental insights that may assist in my analysis.

307. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. § 1001.

Executed this 4th day of February 2026.



Scott Phillips

XI. APPENDIX A: CV

Scott T. Phillips

Professor, Micron School of Materials Science & Engineering

Boise State University

h-index = 43; 13,368 citations

EDUCATION

1999–2004 University of California, Berkeley; Berkeley, CA
Degree Awarded: Ph.D. Organic Chemistry

1995–1999 California State University, San Bernardino (CSUSB); San Bernardino, CA
Degree Awarded: B.S. Chemistry: Biochemistry emphasis.

PREVIOUS EXPERIENCE

2017–present Professor, Micron School of Materials Science & Engineering,
Boise State University, ID

2017 Professor, Penn State University, Department of Chemistry,
University Park, PA

2016–2017 Stephen and Patricia Benkovic Early Career Associate Professor of
Chemistry, Penn
State University, Department of Chemistry, University Park, PA

2014–2016 Martarano Associate Professor of Chemistry, Penn State University,
Department of Chemistry, University Park, PA

2008–2014 Martarano Assistant Professor of Chemistry, Penn State University,
Department of Chemistry, University Park, PA

2006–2008 Research Fellow with George M. Whitesides, Harvard University,
Department of Chemistry & Chemical Biology, Cambridge, MA

1999–2004 Graduate Student with Paul A. Bartlett, University of California, Berkeley, Department of Chemistry, Berkeley, CA

2021 College of Natural Sciences Outstanding Alumni Award,
California State University, San Bernardino

2016	Best presentation, ACS Industrial & Engineering Chemistry Research, 252 nd ACS National Meeting
2016	MSMLG Czarnik Emerging Investigator Award
2016	Selected as the Adhesion Society's 2016 Distinguished Paper
2015	<i>Analytical Methods</i> Emerging Investigator
2015	<i>Polymer Chemistry</i> Emerging Investigator
2015	The Arthur F. Findeis Award for Achievement by a Young Analytical Scientist
2014	<i>Chemical Communications</i> Emerging Investigator

2012	Eberly College of Science highly rated professor in a graduate course
2012	Eli Lilly and Company Young Investigator Award in Analytical Chemistry
2012	Alfred P. Sloan Research Fellow
2012	NSF CAREER Award
2011	Recognized by the PSU Office of Residence Life for having a positive impact on first year students
2011	Chosen as a faculty member who has been instrumental to the academic achievement of first year students (PSU Student Affairs)
2010, 2011, 2012	3M Non-Tenured Faculty Award
2010	Outstanding Professor in Chemistry, Alpha Chi Sigma
2009	Popular Mechanics Breakthrough Award
2009	Gates Foundation Grand Challenge Explorations Award
2009	DARPA Young Faculty Award

2009	Beckman Foundation Young Investigator Award
2009	Thieme Chemistry Journal Awardee
2009	Eberly College of Science Dean's Climate and Diversity Award
2008	Camille & Henry Dreyfus New Faculty Award
2008–2011	<u>Martarano Career Development</u>

Professorship

As a postdoctoral fellow:

2007–2008	NIH Ruth L. Kirschstein National Research Service Award
2004–2007	<u>Damon Runyon Cancer Research Foundation Postdoctoral</u>

Fellowship

As a graduate student:

2002–2004	Eli Lilly Graduate Fellowship
2001–2002	Boehringer Ingelheim Pharmaceutical Inc. Fellowship
2000	<u>Departmental Block</u>

Grant

As an undergraduate student:

1999	Outstanding Undergraduate Student, Natural Sciences
1999	Graduated with Highest Honors and Departmental Honors, CSUSB
1999	Outstanding Achievement in Research for an Associate Member, Sigma Xi
1999	CSUSB Phi Kappa Phi Fellowship Nominee
1999	1 st place CSU State Research Competition
1999, 1997	Associated Students Incorporated (ASI) Research Grant
1998	Barry M. Goldwater Scholarship
1998	ACS Division of Organic Chemistry Outstanding Undergraduate Student Travel Award
1998, 1999	1 st place CSUSB Research Competition
1998	REU summer research fellowship sponsored by NSF and the University of Utah
1998	ASI Travel Grant
1998	Outstanding Undergraduate Student Research Award
1998	8 th Annual New Directions Undergraduate Research Scholar
1995–1999	Alfred F. Moore Scholarship
1995–1999	Dean's List
1995–1999	National Dean's List

PUBLICATIONS

* Designates corresponding author

Boise State:

Note: BSU graduate student and postdoc authors are underlined

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4. Miller-Cassman, T.; Nogales, K. A.; **Phillips, S. T.*** “Amorphous Sugar Materials as Sustainable and Scalable Alternatives for Rigid, Short-Term-Use Products”, *ACS Sustainable Chem. Eng.* **2023**, DOI: 10.1021/acssuschemeng.2c06981. *To be highlighted by the American Chemical Society, both as a press release and a short video, Packaging Insights, German public TV.*
3. Kim, H.; Brooks, A. D.; DiLauro, A. M.; **Phillips, S. T.*** “Poly(carboxypyrrole)s That Depolymerize From Head to Tail in the Solid State in Response to Specific Applied Signals”, *J. Am. Chem. Soc.* **2020**, *142*, 9447–9452.
2. “Self-propagating amplification reactions for molecular detection and signal amplification: Advantages, pitfalls, and challenges”, Sun, X. L.; Shabat, D.; **Phillips, S. T.**; Anslyn, E. V.*, *J. Phys. Org. Chem.*, **2018**, *31*, SI (article number e3827).
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43. “Stimuli-Responsive Polymer Film that Autonomously Translates a Molecular Detection Event into a Macroscopic Change in Its Optical Properties via a Continuous, Thiol-Mediated Self-Propagating Reaction”, Mohapatra, H.; Kim, H.; **Phillips, S. T.***, *J. Am. Chem. Soc.* **2015**, 137, 12498–12501.
42. “Rapid, On-Command Debonding of Stimuli-Responsive Cross-Linked Adhesives by Continuous, Sequential Quinone Methide Elimination Reactions”, Kim, H.; Mohapatra, H.; **Phillips, S. T.*** *Angew. Chem. Int. Ed.*, **2015**, 54, 13063–13067. Selected as a Very Important Paper; Highlighted in *SynFacts* 2015; 11(11): 1153.
41. “Aromatizing Unzipping Polyester for EUV photoresist”, Matsuzawa, K.; Mesch, R.; Olah, M.; Wang, W.; **Phillips, S. T.**; Willson, C. G. *Proc. SPIE—Int. Soc. Opt. Eng.* **2015**, 9425, 1–8. Selected for the SPIE Advanced Lithography 2015 Jeff Byers Award.
40. “Depolymerizable poly(benzyl ether)-based materials for selective room temperature recycling”, Baker, M. S.; Kim, H.; Olah, M. G.; Lewis, G. G.; **Phillips, S. T.***; *Green Chem.* **2015**, 17, 4541–4545.
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38. “Polymeric materials that convert local fleeting signals into global macroscopic responses”, Kim, H.; Baker, M. S.; **Phillips, S. T.***; *Chem. Sci.* **2015**, 6, 3388–3392.

37. “Consider Designing the Readout First When Developing Point-of-Need Assays”,
Phillips, S. T.*, *The Analytical Scientist* **2015**, article #304.
36. “End-capped poly(4,5-dichlorophthalaldehyde): A stable self-immolative poly(aldehyde) for translating specific inputs into amplified outputs, both in solution and the solid state”, DiLauro, A. M.; **Phillips, S. T.***; *Polym. Chem.* **2015**, 6, 3252–3258. (Invited contribution to the 2015 Emerging Investigator issue.)
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27. “Accessibility of Responsive End-Caps in Films Composed of Stimuli-Responsive Depolymerizable Poly(phthalaldehydes)”, DiLauro, A. M.; Zhang, H.; Baker, M. S.; Wong, F.; Sen, A.; **Phillips, S. T.*** *Macromolecules* **2013**, 46, 7257–7265.
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- G.; Robbins, J. S.; **Phillips, S. T.** * *Macromolecules* **2013**, 46, 5177–5183.
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6. “A Structurally Simple Self-Immolative Reagent that Provides Three Distinct, Simultaneous Responses per Specific Detection Event”, Nuñez, S. A.; Yeung, K.; Fox, N. S.; **Phillips, S. T.*** *J. Org. Chem.* **2011**, 76, 10099–10113.

5. “Use of Catalytic Fluoride under Neutral Conditions for Cleaving Silicon–Oxygen Bonds”, DiLauro, A.; Seo, W.; **Phillips, S. T.*** *J. Org. Chem.* **2011**, 76, 7352–7358.
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4. “A Two-Component Small Molecule System for Activity-Based Detection and Signal Amplification: Application to the Visual Detection of Threshold Levels of Pd(II)”, Baker, M. S.; **Phillips, S. T.*** *J. Am. Chem. Soc.* **2011**, 133, 5170–5173.
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3. “Fluidic “Timers” for Paper-Based Microfluidic Devices”, Noh, H.; **Phillips, S. T.***

Anal. Chem. **2010**, 82, 8071–8078. Highlighted in: *Chemistry & Engineering News*, *Philadelphia Inquirer*, *USA Today*, *Gizmag Emerging Technology Magazine*, *Science Magazine: Science Daily News*, *Technology Daily: Style and Reviews Daily News Magazine*, *Science Daily*, *Oil & Gas Industry Today: Paraffin News*, *Medindia.net*, *Laboratory Equipment.com*, *Smart-Grid.tmcnet.com*, *Justmeans*, *Internet Chemistry.com*, *Fluidics: Microfluidics News*, *Physorg.com*, *Indiaofs.com*, *International Hospital*, *Latest Technology Blog*, *Lower my Cholesterol.net*, *Health.gresnews.com*, *Examiner.com*, *Health Info Here*, *Digg.com*.

2. “Patterned Plastics that Change Physical Structure in Response to Applied Chemical Signals”, Seo, W.; **Phillips, S. T.*** *J. Am. Chem. Soc.* **2010**, 132, 9234–9235. Highlighted in: *Nature Chemistry*, twice in *New Scientist* (June 28, 2010 and June 30, 2010), *European Plastics News*, *SYNFACTS*, *JACS Select*, *Plastics News.com*, *Green Earth Africa*, *Platinum Today*, *Iran Daily*, *Techmonitor.net*, *Carbon Capture Report*, *Chemistry in the News: Exploring Chemistry*, *Renewable Energy Blog*.
1. “Metering the Capillary-Driven Flow of Fluids in Paper-Based Microfluidic Devices”, Noh, H.; **Phillips, S. T.*** *Anal. Chem.* **2010**, 82, 4181–4187.

Publications Pre-Penn State:

29. “Adaptive Use of Bubble Wrap for Storing Liquid Samples and Performing Analytical Assays”, Bwambok, D. K.; Christodouleas, D. C.; Morin, S. A.; Lange, H.; **Phillips, S. T.**; Whitesides, G. M. *Anal. Chem.* **2014**, 86, 7478–7485.
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27. “Measuring Binding of Protein to Gel-Bound Ligands with Magnetic Levitation”, Shapiro, N.; Mirica, K. A.; Soh, S.; **Phillips, S. T.**; Taran, O.; Mace, C.; Shevkoplyas, S.; Whitesides, G. M.*, *J. Am. Chem. Soc.*, **2012**, *134*, 5637–5646.

26. “Millimeter-Scale Contact Printing of Aqueous Solutions using a Stamp Made out of Paper and Tape”, Cheng, C.-M.; Gong, J.; Martinez, A. W.; Mazzeo, A. D.; **Phillips, S. T.**; Jain, N.; Whitesides, G. M.*, *Lab Chip*, **2010**, *10*, 3201–3205.

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24. “Paper-Based ELISA”, Cheng, C., Martinez, A. W., Gong, J., Mace, C. R., **Phillips, S. T.**, Carrilho, E., Mirica, K. A., Whitesides, G. M.*, *Angew. Chem. Int. Ed.* **2010**, *49*, 4771–4774.

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13. “FLASH: A Rapid Method for Prototyping Paper-Based Microfluidic Devices”, Martinez, A.; **Phillips, S. T.**; Wiley, B.; Whitesides, G. M.*, *Lab Chip*, **2008**, *8*, 2146–2150. *Highlighted in: Chemical Technology - RSC (Royal Society of Chemistry); Nature Chemistry; New Scientist Tech; Journal of Chemical Education, published by the Division of Chemical Education of the American Chemical Society, called Research Advances (RA); ranked as the most accessed article in Lab on a Chip for September 2008.*
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11. “Density-Based Diamagnetic Separation: Devices for Detecting Binding Events and for Collecting Unlabeled Diamagnetic Particles in Paramagnetic Solutions”, Winkleman, A.; Perez-Castillejos, R.; Gudikson, R.; **Phillips, S. T.**; Prentiss, M.; Whitesides, G. M.*, *Anal. Chem.* **2007**, *79*, 6542–6550.

10. “Syntheses of the Eastern Halves of Ritterazines B, F, G, and H, Leading to Reassignment of the Stereochemistry of Ritterazines B and F” **Phillips, S. T.**; Shair, M. D.*, *J. Am. Chem. Soc.* **2007**, *129*, 6589–6598.
9. “Patterned Paper as a Platform for Inexpensive, Low Volume, and Portable Bioassays” Martinez, A.; **Phillips, S. T.**; Butte, M.; Whitesides, G. M.*, *Angew. Chem. Int. Ed.* **2007**, *46*, 1318–1320. *Highlighted in: Nature, Chem. Eng. News, Anal. Chem.*, and other journals. ***This body of work was chosen as a 2009 Breakthrough of the Year by Popular Mechanics.***
8. “Quantifying the Interactions that Contribute to beta-Hairpin Folding” **Phillips, S. T.**; Piersanti, G.; Bartlett, P. A.*, *Proc. Natl. Acad. Sci. USA* **2005**, *102*, 13737–13742.
7. “@-Tides as Reporters for Molecular Associations” **Phillips, S. T.**; Blasdel, L. K.; Bartlett, P. A.*, *J. Am. Chem. Soc.* **2005**, *127*, 4193–4198.
6. “@-Tide-Stabilized beta-Hairpins” **Phillips, S. T.**; Blasdel, L. K.; Bartlett, P. A.*, *J. Org. Chem.* **2005**, *70*, 1865–1871.
5. “Facile Synthesis of @-Tide beta-Strand Peptidomimetics: Improved Assembly in Solution and on Solid Phase” **Phillips, S. T.**; Piersanti, G.; R  th, M.; Gubernator, N.; van Lengerich, B.; Bartlett, P. A.*, *Org. Lett.* **2004**, *6*, 4483–4485.
4. “@-Tides: The 1,2-Dihydro-3(6H)-pyridinone Unit as a beta-Strand Mimic”, **Phillips, S. T.**; Rezac, M.; Abel, U.; Kossenjans, M.; Bartlett, P. A.*, *J. Am. Chem. Soc.* **2002**, *124*, 58–66.
3. “Avocadofurans and Their Tetrahydrofuran Analogs: Double Bonds are Critical for Toxicity to Insects” Rodriguez-Saona, C. R.; **Phillips, S. T.**; Maynard, D. F.; Trumble, J. A.*, *J. Agric. Food Chem.* **2000**, *48*, 3642–3645.

2. “Effects of Alkyl Side-Chain Length on Insecticidal Activity”
Rodriguez-Saona, C. R.; Maynard, D. F.; **Phillips, S.**; Trumble, J. A.*, *J. Nat. Prod.* **1999**, 62, 191–193.
1. “Yeast Protein Farnesyltransferase. Binding of S-Alkyl Peptides and Related Analogs” Rozema, D. B.; **Phillips, S. T.**; Poulter, C. D.*, *Org. Lett.* **1999**, 1, 815–817.

BOOK CHAPTERS

3. **Phillips, S. T.***; Lewis G. G. “Quantitative Point-of-Care (POC) Assays Using Measurements of Time as the Readout: A New Type of Readout for mHealth”, in *Methods in Molecular Biology*, 1256; Springer: New York, 2015; pp 213–230. (Invited book chapter.)
2. **Phillips, S. T.***; Thom, N. K. “Three-Dimensional, Paper-Based Microfluidic Devices Containing Internal Timers for Running Time-Based Diagnostic Assays”, in *Microfluidic Diagnostics, Methods and Protocols*; Jenkins, G.; Mansfield, C. D., Eds.; *Methods in Molecular Biology* 949; Springer: New York, 2013; pp 185–196. (Invited book chapter.)
1. Cloninger, M. J.; Bilgicer, B.; Li, L.; Mangold, S. L.; **Phillips, S. T.**; Wolfenden, M. L. “Multivalency”, in *Supramolecular Chemistry: From Molecules to Nanomaterials*; Steed, J. W.; Gale, P. A., Eds.; Wiley, 2012.

BUSINESS EXPERIENCE

Founder, Remix Materials, LLC | Boise, ID

2022–present

Developed methods to manufacture recycled plastic lumber

Founder, Fives Designs, LLC | Boise, ID

2022–present

Developed STEM toys that are safe for children aged 3+.

Owner, Citizen Scientific Workshop, LLC | Boise, ID

2023–2024

Established safety measures for preventing and handling fires, burns, metal dust, cuts, and manufacturing noise.

ADDITIONAL ANALYSIS & COMMUNICATION EXPERIENCE

- **Journal referee** for manuscript submissions to over 37 journals, often reviewing multiple manuscripts for each journal.
- **Grant referee** for more than 11 different agencies.
- **Service** on ~50 different committees, several as committee chair.

XII. APPENDIX B: TESTIMONY HISTORY

PATENTS and PATENT APPLICATIONS

16. Building Panel; Inventors: **PHILLIPS ST**, MILLER-CASSMAN T; U.S. Patent No. D1104163, Dec 2, 2025.
15. Interlocking Building Panels; Inventors: **PHILLIPS ST**, MILLER-CASSMAN T; US Provisional application number 63476700, filed Dec 22, 2022.
14. Cyanoacrylate Copolymers; Inventors: **PHILLIPS S T**, CHRISTY A; US provisional patent application number 63/854,723, filed July 31, 2025.
13. Layered Constructions With Removable Layers; Inventors: **PHILLIPS S T**, MILLER R, NOGALES K, BARTHOLOMEW E L, DHOPATKAR N; WO 2023/275849 A1, filed July 1, 2022.
12. Sugar-based Composite Materials as Alternatives to Plastics; Inventors: **PHILLIPS S T**, MILLER-CASSMAN T; US provisional patent application number 63371904, filed August 19, 2022.
11. Stable Poly(alkyl aldehyde)s; Inventors: **PHILLIPS S T**, NOGALES K A; PCT application number PCT/US22/36025, filed July 1, 2022.
10. Portable Analytic Device and Methods of Use Thereof; Inventors: **PHILLIPS S T**, LEWIS G G, RITTER D W, BROOKS A; US20160074861A1.
9. Qualitative and Quantitative Point-of-Care Assays; Inventors: **PHILLIPS S T**, LEWIS G G, ROBBINS J S; US9932360B2.
8. Fluidic device; Inventors: **PHILLIPS S T**, THOM N K, NOH H; Patent Number(s): US2011240151-A1; WO2011123633-A2; WO2011123633-A3.
7. Signal-responsive plastics; Inventors: **PHILLIPS S T**, SEO W, ROBBINS J, OLAH M, SCHMID K, DILAURO A M; Patent Number(s): WO2012005806-A2; WO2012005806-A3; US2014242623-A1; US8871893-B2.

6. Three-dimensional microfluidic device for e.g. running multiple assays, has fluid-impermeable layer formed between patterned porous and hydrophilic layers, and porous hydrophilic medium placed in opening unit of fluid-impermeable layer; CARRILHO E, MARTINEZ A W, MIRICA K A, **PHILLIPS S T**, SIEGEL A C, WHITESIDES G M, WILEY B, MARTINEZ A, MIRICA K, **PHILLIPS S**, SIEGEL A, WHITESIDES G, EMMANUEL K, ANDEURESEU DEOBEULYU M, KAESEORIN EI M, SEUKAT TI P, ADAMSEU SSI S, BENJAMIN W, JOJI EM H; Patent Number(s): WO2009121037-A2 ; WO2009121037-A3 ; EP2257819-A2 ; AU2009228091-A1 ; KR2010127301-A ; CA2719320-A1 ; CN102016595-A ; US2011123398-A1 ; IN201003492-P2 ; US8628729-B2 ; CN102016595-B ; AU2009228091-B2.
5. Patterning porous, hydrophilic substrate e.g. paper into hydrophobic and hydrophilic regions involves contacting substrate with hydrophobic material, covering one face of substrate, disposing preselected pattern, and curing the material; Inventors: MARTINEZ A W, **PHILLIPS S T**, WHITESIDES G M, WILEY B; Patent Number(s): WO2010022324-A2 ; WO2010022324-A3.
4. New assay device comprises a porous, hydrophilic medium, and a fluid impervious barrier comprising polymerized photoresist, useful for detecting the presence of an analyte in a liquid sample; Inventors: WHITESIDES G M, **PHILLIPS S T**, MARTINEZ A W, BUTTE M J, WONG A, THOMAS S, SINDI H, VELLA S J, CARRILHO E, MIRICA K A, LIU Y, THOMAS S W, GEORGE, SCOTT, ANDRES, MANISH, AMY W, SAMUEL T, HAYAT S, SARAH J V, EMANUEL C, KATHERINE; Patent Number(s): WO2008049083-A2 ; WO2008049083-A3 ; EP2076775-A2 ; IN200901647-P2 ; AU2007310987-A1 ; CA2667702-A1 ; CN101578520-A ; US2009298191-A1 ; ZA200903373-A ; JP2010515877-W ; JP2012230125-A ; US8377710-B2 ; US2013128036-A1 ; US8603832-B2 ; AU2007310987-B2 ; BR200718473-A2 ; US2014234881-A1 ; IL198185-A ; JP5684757-B2.
3. Microfluidic paper-based analytical device for performing enzyme-linked immunosorbent assay (ELISA) of e.g. blood, has hydrophilic region and test zone which are provided with reagent when region is in fluid communication with zone; WHITESIDES G M, MIRICA K A, MARTINEZ A W, CHENG C, **PHILLIPS S T**, MASCARENAS M, LIU X, LI X, WHITESIDES G, MIRICA K, MARTINEZ A, **PHILLIPS S**; Patent Number(s): WO2011097412-A1 ; CA2788113-A1 ; AU2011212916-A1 ; EP2531300-

A1 ; US2013034869-A1 ; CN102821861-A ; IN201201876-P2 ; US8821810-B2 ; CN102821861-B ; AU2011212916-B2.

2. Detecting differences in density in insoluble particles or materials by providing solution comprising paramagnetic salt, exposing material having first density to density modifying agent and applying magnetic field to paramagnetic solution; Inventors: **PHILLIPS S T**, **WHITESIDES G M**, **MIRICA K A**, **CARRILHO E**, **MARTINEZ A W**, **SHEVKOPLYAS S S**, **SNYDER P W**, **PEREZ-CASTILLEJOS R**, **GUPTA M**, **WINKLEMAN A**, **GUDI KSEN K L**, **GUDI KSEN K**, **MARTINEZ A**, **MIRICA K**, **PHILLIPS S**, **SHEVKOPLYAS S**, **SNYDER P**, **WHITESIDES G**; Patent Number(s): WO2009006409-A2 ; WO2009006409-A3 ; EP2167216-A2 ; US2010285606-A1 ; EP2167216-B1.
1. Assay device for use in paper-based microfluidic system, has fluid-impermeable barrier permeating thickness of substrate and defining boundary of main channel and assay regions, where barrier is made of photoresist or curable polymer; Inventors: **DICKEY M D**, **MARTINEZ A W**, **PHILLIPS S T**, **ROZKIEWICZ D**, **SIEGEL A C**, **WHITESIDES G M**, **WILEY B**, **ADAMSEU SSI S**, **SEUKAT TI P**, **MAIKEUL DI D**, **DOROTA R**, **BENJAMIN W**, **JOJI EM H**, **ANDEURESEU DEOBEULYU M**, **SIEGEL A**, **PHILLIPS S**, **DICKEY M**, **WHITESIDES G**, **MARTINEZ A**; Patent Number(s): WO2009121041-A2 ; WO2009121041-A3 ; AU2009228012-A1 ; KR2010128340-A ; EP2265958-A2 ; CA2719800-A1 ; US2011111517-A1 ; CN102016596-A ; IN201004001-P2 ; CN102016596-B ; US8921118-B2

EXPERT WITNESS EXPERIENCE

1. ITC 337-TA-1116, Certain Blood Cholesterol Testing Strips and Associated Systems Containing the Same; 2018. The case involved porous, soft materials and analytical tests conducted on the materials.

CONSULTING CONTRACTS and/or CONFIDENTIALITY AGREEMENTS

1. Ramôn Law, 2018 – 2019
2. Avery Dennison Corporation, 2018 – present
3. Akita Innovations, 2018 – 2019

4. Physical Sciences Incorporated, 2018 – 2019
5. Teledyne-FLIR, 2020 – 2021

XIII. APPENDIX C: PHOTOGRAPHS



FIG 1: Front view of all labels received



FIG 2: Back view of all labels received

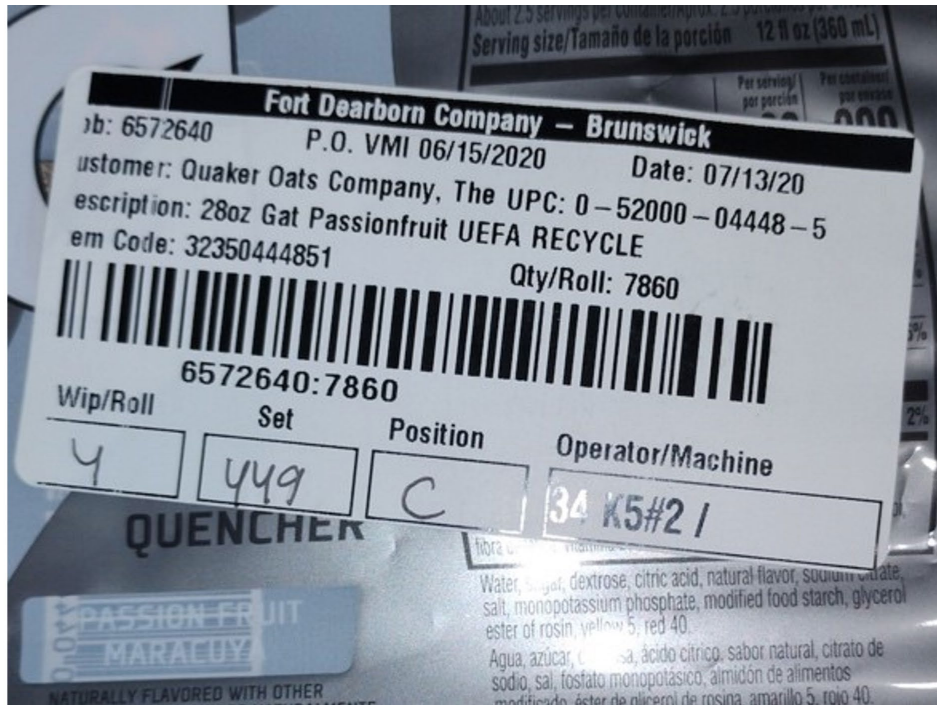


FIG 3: Manufacturer label on Passion Fruit Maracuya Gatorade Label

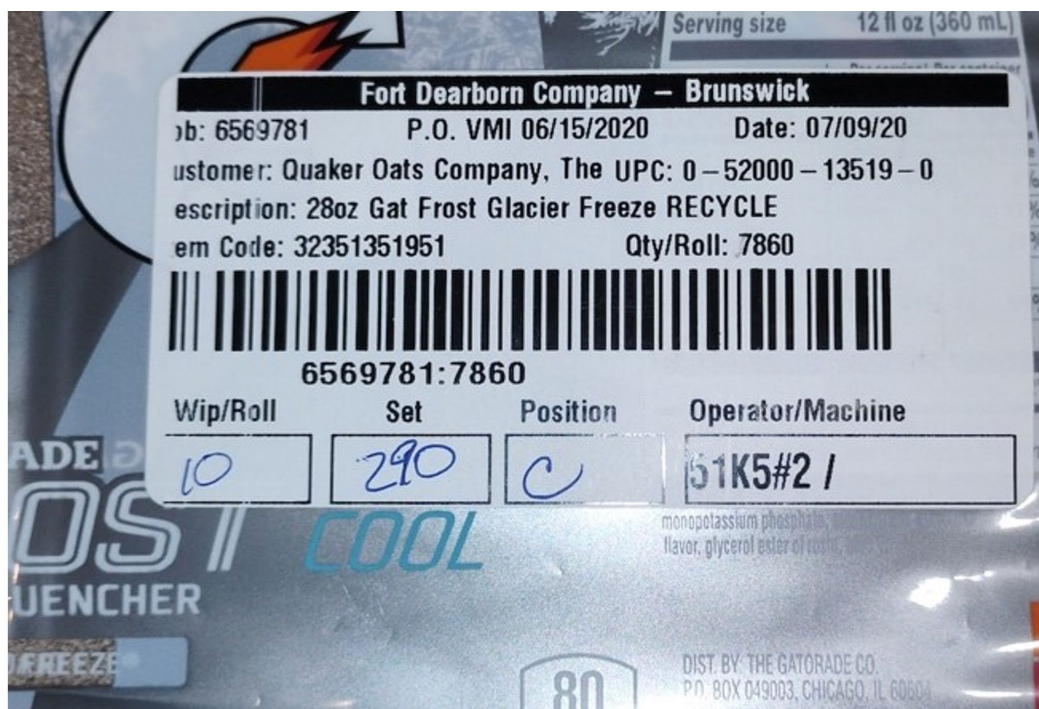


FIG 4: Manufacturer label on Glacier Freeze



FIG 5: Recycling code on back of Febreze Label



FIG 6: Front view of cut-open Gatorade Glacier Freeze label



FIG 7: Back view of cut-open Gatorade Glacier Freeze label



FIG 8: Photographic setup for magnified view of labels. A back light was created by placing a white piece of paper over a Honeywell light, then placing the Gatorade label over the white piece of paper. Photographs were acquired from the top-down perspective, and all digital images were adjusted automatically for clarity and brightness using the “auto color” feature. The images were cropped to show the sections that were best in focus in the image.



FIG 9: Front view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 10: Front view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 11: Back view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 12: Front view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 13: Back view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 14: Front view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 15: Back view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 16: Front view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 17: Back view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 18: Front view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens



FIG 19: Back view of portion of Gatorade Glacier Freeze label using backlighting and zoom lens