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Paper No. ____
Date: December 27, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CARGILL INCORPORATED,
Petitioner,

v.

BUNGE LODERS CROKLAAN USA, LLC,
Patent Owner.

Case IPR2024-01360
Patent 7,645,473

DECLARATION OF ERIC A. DECKER, PH.D.

BUNGE 2001
Cargill v Bunge
IPR2024-01360

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TABLE OF MATERIALS CONSIDERED

Exhibit Number	Description
1001	U.S. Patent No. 7,645,473 issued January 12, 2010 to Herzing et al. (the “’473 Patent”)
1002	File History for U.S. Patent Application Serial No. 11/451,606 which issued as U.S. Patent No. 7,645,473
1003	Declaration of Alejandro G. Marangoni, Ph.D. in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 7,645,473 (“Marangoni Declaration”)
1007	Petrauskaite, V., W. De Greyt, M. Kellens, and A. Huyghebaert. “Physical and Chemical Properties of Trans-Free Fats Produced by Chemical Interesterification of Vegetable Oil Blends.” <i>Journal of the American Oil Chemists Society</i> , 75(4) (April 1998): 489-493 (“Petrauskaite”)
1008	Hustedt, H. H. “Interesterification of Edible Oils.” <i>Journal of the American Oil Chemists Society</i> , 53(6), Part2 (June 1976): 390-392 (“Hustedt”)
1009	Idris, Nor Aini, Kurt G. Berger, and Augustine S. H. Ong. “Evaluation of Shortenings Based on Various Palm Oil Products.” <i>Journal of the Science of Food and Agriculture</i> , 46(4) (January 1989): 481-493 (“Idris”)
1011	Neff, W. E., M. A. El-Agaimy, and T. L. Mounts. “Oxidative Stability of Blends and Interesterified Blends of Soybean Oil and Palm Olein.” <i>Journal of the American Oil Chemists Society</i> , 71(10) (October 1994): 1111-1116 (“Neff”)
1014	Deffense, E. “Fractionation of Palm Oil.” <i>Journal of the American Oil Chemists Society</i> , 62(2) (February 1985): 376-385 (“Deffense”)

Exhibit Number	Description
Paper 1	Petition for <i>Inter Partes</i> Review of U.S. Patent No. 7,645,473 under 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 <i>et set</i> . (“Petition”)
2002	<i>Curriculum Vitae</i> of Eric A. Decker, Ph.D.
2003	Gurr et al., “Lipids in Foods,” <i>Lipid Biochemistry</i> , 5 th ed., Osney Mead, Oxford: Blackwell Science, pp. 131-132 (2002) (“Gurr”)
2004	Wang, “Soybean Oil,” Gunstone ed, <i>Vegetable Oils in Food Technology: Composition Properties and Uses</i> , Boca Raton, Florida:CRC Press LLC, pp. 18-58 (2002) (“Wang”)
2005	Lin, “Palm Oil”, Gunstone ed., <i>Vegetable Oils in Food Technology: Composition Properties and Uses</i> , Boca Raton, Florida:CRC Press LLC, pp. 59-97 (2002) (“Lin”)
2006	Rossell et al., “Composition of Oil,” <i>Journal of the American Oil Chemists’ Society</i> , 62(2):221-230 (1985) (“Rossell”)
2007	FAO and WHO. 1999. Standard for Named Vegetable Oils. Codex Alimentarius Standard, No. CXS 210-1999. Codex Alimentarius Commission. Rome. (“Codex Stan”)

I, ERIC A. DECKER, HEREBY DECLARE:

1. I have been retained by counsel for Patent Owner Bunge Loders Croklaan USA, LLC (“Patent Owner” or “PO”), in connection with the above-captioned *Inter Partes* Review (“IPR”) proceeding.

2. I submit this Declaration in the above-captioned proceeding to provide my expert opinion in support of Patent Owner’s Preliminary Response to the Petition for IPR submitted by Cargill, Incorporated (“Petitioner”) of U.S. Patent No. 7,645,473 (the ’473 Patent”, **EX1001**).

3. I am being compensated at an hourly rate of \$500 for consulting. My compensation is not in any way dependent on the statements I set forth herein or the outcome of this proceeding. I hold no interest in either the Patent Owner (Bunge Loders Croklaan USA, LLC) or the Petitioner (Cargill, Incorporated).

I. EXPERTISE

A. Professional Qualifications And Experience

4. I am a Professor of Food Science at the University of Massachusetts Amherst. My qualifications and credentials are fully set forth in my *curriculum vitae* filed concurrently herewith as **EX2002**. For ease of reference, I have highlighted certain information below.

5. I am an expert in the fields of lipids, lipid oxidation, and health implications of bioactive lipids and on preventing oxidation in human food supply.

My research group is actively conducting research to characterize mechanisms of lipid oxidation, antioxidant protection of foods, and health implications of bioactive lipids.

6. I have published over 510 peer-reviewed journal articles, reviews, co-edited books, and book chapters. I was named by The Institute for Scientific Information (ISI) as one of the Most Highly Cited Scientists in the field of Agriculture.

7. I have made over 200 presentations to industry and academic and professional organizations during my career.

8. I have been the recipient of several awards beginning with the Institute of Food Technologists for the Stephen Chang Award for Lipid Science, Research and Development Award (2006), and Samuel Cate Prescott Award for Young Scientist (1997). I have also been awarded the Stephen Chang Award from the American Oil Chemist Society (2008), the Agriculture and Food Chemistry Division of the American Chemical Society's Young Scientist Award (1994), the International Life Science Institute's Future Leader Award (1996), and the American Meat Science Association's Achievement Award (1993).

9. I have served on numerous committees, including the U.S. Food and Drug Administration (FDA) Food Advisory Committee (2007-2010), as well as

the Institute of Medicine's Food Forum (2007-2012 and 2020 - present) and Nutritional Standard for Food in Schools Committee.

B. Education

10. I graduated from The Pennsylvania State University (Penn State) with a B.S. degree in Biology in 1982. In 1985, I earned a M.S. in Food Science and Human Nutrition from Washington State University. In 1989, I earned a Ph.D. in Food Science from the University of Massachusetts, Amherst, where I was a U.S. Department of Agriculture (USDA) National Needs Fellow.

C. Career Overview

11. As stated above, I am currently a professor in the Department of Food Science in the College of Natural Sciences at the University of Massachusetts Amherst.

12. I was an Assistant Professor in the Food Science Section of the Department of Animal Sciences at the University of Kentucky from 1988 to 1993, after which I joined the University of Massachusetts Amherst as an Associate Professor in Food Chemistry. I was named the Fergus Clydesdale Endowed Chair at the University of Massachusetts Amherst from 2002-2007.

D. Publications And Patents

13. In addition to my numerous peer-reviewed publications noted above, I am an inventor of over 10 different inventions in my research field of lipid chemistry and lipid oxidation for which patent applications have been filed.

E. Curriculum Vitae

14. For more details of my professional qualifications and experience, education, career overview, and publications and patents, please see the *curriculum vitae* filed concurrently herewith as **EX2002**.

15. Based on the above outlined education and experience, I have a detailed understanding of the state of the art during the relevant period, as well as a sound basis for opining on how a person of ordinary skill in the art at that time would understand or conclude on the technical issues in this case or the conclusions they would reach from said issues.

16. On the basis of my education and the experience described above, I believe I am qualified to give the opinions below.

II. MATERIALS CONSIDERED

17. For purposes of this Declaration, I have reviewed and, where applicable, relied upon the information and/or teachings of the documents identified in the TABLE OF MATERIALS CONSIDERED outlined above.

18. In particular, I have carefully considered the '473 Patent, the Petition, the Declaration of Alejandro G. Marangoni, Ph.D. in Support of Petition for *Inter Partes* Review of U.S. Patent No. 7,645,473 (“Marangoni Declaration”) (**EX1003**), and all references cited therein, even if not expressly listed in my Table of Materials Considered above.

19. I also base my opinions on my professional and academic experience.

20. My opinions in this Declaration are based upon the information that I have received to date. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the Critical Date (as defined below).

21. This Declaration and my opinions are based on knowledge and information currently available to me. I reserve the right to continue my analysis and may supplement the opinions set forth in this Declaration to the extent that additional information becomes available or if I am asked to consider additional information or attain supplemental insights that may result in added observations. Further, I reserve the right to consider and comment on any statements or opinions rendered by any declarants in this matter.

III. LEGAL PRINCIPLES USED IN THE ANALYSIS

22. While I am neither a patent lawyer nor an expert in patent law, I have been advised by counsel of the applicable legal standards for patent invalidity. I understand and have relied upon these legal principles, as explained to me by counsel, in forming my opinions set forth in this Declaration.

23. I have been advised by counsel and understand that a petitioner in an *inter partes* review proceeding must prove unpatentability by a preponderance of the evidence. I have been advised by counsel and understand that the preponderance of the evidence standard means that the petitioner must show that it is more likely than not that the patent at issue is invalid. The statements below are my understanding regarding the applicable law as those legal standards have been explained to me. I have used these understandings of these legal principles, as set forth in this section, to analyze the '473 Patent.

24. I have been advised by counsel and understand that a patent can be found invalid for several reasons, including, among others: (i) being anticipated by the prior art or (ii) being obvious in view of the prior art. My understanding of each of these bases for invalidity is discussed in greater detail below.

25. I understand that in undertaking an invalidity analysis, the claims are to be interpreted from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the earliest priority date of the '473 Patent, and I have

done so during my review of the materials. The ‘473 Patent was filed June 13, 2006 (the “Critical Date”). Counsel has informed me that the Critical Date represents the earliest possible priority date to which the challenged claims of ‘473 Patent are entitled, and I have therefore used that Critical Date in my analysis below. The analysis I discuss throughout this report is intended to reflect these parameters even if I use the present tense.

A. Anticipation

26. I have been advised by counsel and understand that one way to show that a patent claim is invalid is to show that the claim is anticipated by a prior art reference. I understand this to mean that the patent claim is not new or novel in view of the prior art.

27. I have been further advised by counsel and understand that to determine whether a prior art reference anticipates a patent claim requires a comparison of the claim language to the prior art on a limitation-by-limitation basis. I have been advised by counsel and understand that a prior art reference “anticipates” under 35 U.S.C. § 102 and renders a patent claim invalid if all of the claim’s limitations are expressly or inherently disclosed in that single prior art reference. The disclosure in the prior art reference does not have to use the same words as the claim, but all of the requirements of the claim must be expressly or inherently present.

28. I have been advised by counsel and understand the scope of prior art that can be used in an anticipation analysis as set forth in 35 U.S.C. § 102. In particular, I have been advised by counsel and understand that a patent or publication qualifies as prior art to an asserted patent claim if it was published prior to the invention of the asserted patent claim or more than one year before the filing date of the application of the asserted patent. I have been further advised by counsel and understand that a patent issued on a patent application filed before the invention of the asserted patent claim also is prior art to the asserted patent claim.

29. I have been advised by counsel and understand that a prior art reference anticipates a patent claim when the claim limitations are not expressly found in that reference, but the claim limitations are nonetheless inherent in it. I have been advised by counsel and understand that express disclosure means that the subject matter is clearly described in the prior art reference.

30. I have been advised by counsel and understand that a limitation or the entire invention is inherent and in the public domain if it is the natural result flowing from the explicit disclosure of the prior art. I have been advised by counsel and understand that for a claimed element to be inherently present within a prior art document, it must necessarily be present. That is, the prior art reference must necessarily function in accordance with or include the claimed element. I have been advised by counsel and understand that inherency may not be established by

probabilities or possibilities—the mere fact that a certain thing may result from a given set of circumstances is not sufficient.

31. I have been advised by counsel and understand that in some cases, the inherent property corresponds to a claimed new benefit or characteristic of a purported invention otherwise in the prior art. I have been advised by counsel and understand that in such circumstances, the new realization alone does not render the old invention patentable.

32. I have been further advised by counsel and understand that when a prior art method is at issue, the inherent anticipation examines the natural and inherent results in that method without regard to the full recognition of those benefits or characteristics within the art field at the time of the prior art disclosure.

B. Obviousness

33. I have been advised by counsel and understand that a patent claim is invalid as being obvious in view of the prior art if the differences between the patented subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person having ordinary skill in the art. *See* 35 U.S.C. § 103. In making a determination of obviousness, I have been advised by counsel and understand that the following factors are analyzed: (i) the scope and content of the prior art; (ii) the differences, if

any, between the prior art and the claims at issue; (iii) the level of ordinary skill in the pertinent art; and (iv) objective evidence of non-obviousness, if any exists.

34. I have been advised by counsel and understand that any of the following rationales are some of the acceptable bases for the conclusion that a claim would have been obvious in light of the prior art: (i) the claimed invention is simply a combination of prior art elements according to known methods to yield predictable results; (ii) the claimed invention is a simple substitution of one known element for another to obtain predictable results; (iii) the claimed invention uses known techniques to improve similar devices (methods, or products) in the same way; (iv) the claimed invention was “obvious to try” because it was a choice from a finite number of identified, predictable solutions, with a reasonable expectation of success; (v) there is known work in one field of endeavor that may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces, if the variations would have been predictable to a POSITA; or (vi) there is some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior art references or to combine prior art reference teachings to arrive at the claimed invention.

35. I have been advised by counsel and understand that for a patent claim to have been considered obvious at the time the invention was made, each and every limitation of the claim must be present within the prior art, or within the prior

art in combination with the general knowledge held by a POSITA, and that such a person would have had a reasonable expectation of success in combining these teachings to achieve the claimed invention.

36. I have also been advised by counsel and understand that the reason to select and combine features, the predictability of the results of doing so, and a reasonable expectation of success of doing so may be found in the teachings of the prior art themselves, in the nature of any need or problem in the field that was addressed by the patent, in the knowledge of a POSITA in the field at the time, as well as in common sense or the level of creativity exhibited by a POSITA. I have been advised by counsel and understand that there need not be an express or explicit suggestion to combine references.

37. I have been advised by counsel and understand that substituting one known element for another known element would have been obvious when it leads to reasonably predictable results.

38. I have been advised by counsel and understand that a combination of elements would have been obvious when a POSITA would have had a good reason or motivation, without hindsight, to pursue the combination, which is among a finite number of known options within his or her technical grasp, and leads to reasonably expected results.

39. I have been advised by counsel and understand that a prior art reference can be said to teach away when a POSITA would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken in the claimed invention. I have been advised by counsel and understand that the mere disclosure of more than one alternative does not constitute a teaching away from alternatives that are not disclosed when the prior art does not criticize, discredit, or otherwise discourage the solution claimed in the alleged invention. Similarly, I have been advised by counsel and understand that a prior art reference that merely expresses a general preference for an alternative invention does not teach away.

IV. PERSON HAVING ORDINARY SKILL IN THE ART (“POSITA”)

40. I have been advised by counsel and understand that an assessment of the claims of the '473 Patent should be undertaken from the perspective of what would have been known or understood by a POSITA as of the Critical Date of the patent claims. Therefore, I have used the Critical Date (June 13, 2006) of the '473 Patent as the point in time for the assessment of the '473 Patent and any materials that qualify as prior art.

41. Counsel has advised me and I understand that to determine the appropriate level of one of ordinary skill in the art, I may consider the following factors: (a) the types of problems encountered by those working in the field and prior

art solutions thereto; (b) sophistication of the technology in question, and the rapidity with which innovations occur in the field; (c) the education level of active workers in the field; and (d) the education level of the inventor.

42. The relevant technical field for the '473 Patent is food chemistry and, more specifically, vegetable fat compositions comprising glycerides. Even more specifically, the technical field pertains to the triglyceride content of blended vegetable fat compositions and their performance in baked products and iced confectionary products. Based on this, and the four factors above, in my opinion a POSITA as of June 13, 2006, would have had the equivalent of a Bachelor's degree in food science or food chemistry with at least about 5 years of working experience in vegetable fat compositions in the food industry. Additional education, such as a Master's degree or Ph.D. in food science or food chemistry, could substitute for some of the work experience, and similarly, extensive experience in the field of vegetable fat compositions could serve as a substitute for formal education.

43. My opinions regarding the level of ordinary skill in the art are based on, among other things, my extensive experience in the relevant field, my understanding of the basic qualifications that would be relevant to a food scientist tasked with investigating the compositions in the relevant area, and my familiarity with the backgrounds of colleagues, co-workers, and employees, both past and present, who work in the technical field.

44. Although my qualifications and experience exceed those of the hypothetical POSITA defined above, I have a good understanding of the capabilities of one of ordinary skill based on my experience. Indeed, I have participated in many organizations and worked closely with many such persons over the course of my career. Based on my knowledge, skill, and experience, I have an understanding of the capabilities of one of ordinary skill, and I possess those capabilities myself. I confirm that my analysis and opinions regarding the '473 Patent are based on the perspective of a POSITA as of the Critical Date (June 13, 2006).

45. I note that when Dr. Marangoni defines a POSITA for his analysis, he fails to base his definition on an artisan's skill level as of the Critical Date of the '473 Patent, namely June 13, 2006. Instead, he defines a POSITA without reference to any relevant time period. Based on this, it appears that Dr. Marangoni's analysis is based on the knowledge of a POSITA without regard to a time period.

V. U.S. PATENT NO. 7,645,473

46. The '473 Patent (EX1001), entitled "Fat Composition," which issued on January 12, 2010, was filed as U.S. Patent Application Serial No. 11/451,606 on June 13, 2006.

47. I understand that Loders Croklaan USA LLC was the original Assignee and Anthony George Herzing, Gerald Patrick McNeill, and Harold Kazier

are the named inventors on the face of the '473 Patent. A Change of Name assignment was subsequently recorded August 7, 2024, at Reel/Frame 068209/0243, which identified Loders Croklaan USA LLC as Assignor and Patent Owner Bunge Loders Croklaan USA, LLC as Assignee.

A. Specification

48. I have reviewed the '473 Patent in detail. The '473 Patent generally describes a vegetable fat composition comprising glycerides. EX1001, Abstract. In particular, the '473 Patent relates to “a vegetable fat composition comprising triglycerides and to its applications in baked products and iced confectionary products.” EX1001, 1:6-8. The '473 Patent explains that many food products contain fats, and there is a desire amongst consumers for food products that have a low content of trans fatty acids and a low content of saturated fatty acids. EX1001, 1:9-12. Attaining such products requires blending and modification of the triglyceride composition of the fats; however, “this is a complex problem since most fats rely on the fatty acids of the component triglycerides, for example the saturated fatty acids, in order to achieve the correct balance of organoleptic properties.” EX1001, 1:13-17. The '473 Patent notes that there are many examples of fat compositions for use in food products, but that there remains a need for good quality bakery fats with low trans fat and low saturated fatty acid (SAFA) content. EX1001, 2:4-5.

49. The '473 Patent discloses an improved vegetable fat composition comprising glycerides with specific content of SSS, SUS, SSU, SU₂, and U₃ triglycerides, where "S" is a saturated fatty acid residue having 16 to 24 carbon atoms and "U" is an unsaturated fatty acid residue having at least 18 carbons. EX1001, 2:10-19. The invention is based on a fat composition that has particularly beneficial properties when used in bakery applications and in confectionery icing. EX1001, 2:65-67. The composition has a low saturated fatty acid content and also a low trans fatty acid content, while still maintaining desirable functional and organoleptic properties, including structure and appearance of the finished product and mouth feel. EX1001, 3:1-5. The composition is produced as a blend of fats, including an interesterified palm olein with an iodine value (IV) of 45 to 70 and a palm oil fraction with a SUS-content of less than 50 wt% and SSS-content of at least 20 wt%. The blend can further comprise a liquid oil, such as canola oil. EX1001, 3:6-15. The composition may be produced by blending commercially available fats. EX1001, 4:43-44. The amounts of the components of the blend are selected so as to achieve the desired—and claimed—triglyceride composition, and the composition may be used as shortening in bakery products or as components of icing compositions for confectionery. EX1001, 4:53-55, 4:62-64. The composition may impart one or more beneficial properties to the finished product, including

mouthfeel, appearance, structure (including, for baked products, crumb firmness), and/or aeration. EX1001, 4:64-67.

50. In one embodiment, the inventive composition of the '473 Patent is a reduced saturate fat blend prepared by blending together a commercially available refined, bleached deodorized canola oil, a commercially available refined, bleached deodorized palm stearin with an iodine value (IV) of 35, and a commercially available fully interesterified palm olein with an iodine value (IV) of 55 (refined, bleached and deodorized). The components were melted and blended together in a tank to a final weight of 91 kg (200 pounds) according to the following formula (EX1001, 5:39-59 (Example 1)):

- Canola oil – 33 kg (72 lbs.)
- Palm Stearin (IV35) – 19 kg (42 lbs.)
- Interesterified Palm Olein (IV55) – 39 kg (86 lbs.).

51. This blend was stirred to mix the components and cooled to crystalize the blend into a smooth, semi-solid mass suitable for use as a bakery shortening. EX1001, 5:60-63 (Example 1). The reduced saturated bakery shortening was evaluated by preparing a cookie with the shortening, which produced a cookie that was almost indistinguishable in texture and mouthfeel from cookies made with a high saturate shortening (50% saturates) EX1001, 6:54-62 (Example 2). I note this result compares favorably to a simple blend of canola oil and palm

stearin (IV35) with 35% saturates, the reduced saturated shortening of the invention had the ability to cream with the sugar and maintain aeration, while cookies prepared with the simple blend lacked the desired structure, exhibited excess spread, crumb firmness (lack of tenderness), and had a greasy/oily mouthfeel. EX1001, 6:62-37 (Example 2).

52. The '473 Patent provides evidence demonstrating that the inventive composition performed better than a high saturated shortening. Cake icing prepared with the reduced saturated shortening was comparable to that prepared with a high saturated shortening (50% saturates) with respect to texture and degree of aeration (as measured by specific gravity) immediately after manufacture and during subsequent storage. EX1001, 7:5-11 (Example 3). In comparison, icings prepared with a simple blend of canola oil and palm stearin (IV35) aerated well initially, but quickly lost structure and aeration during storage. As a result, this icing had an undesirable shiny/oily appearance and a gritty mouthfeel. EX1001, 7:12-18 (Example 3).

B. Prosecution History

53. I have reviewed and analyzed the prosecution history of the '473 Patent. *See generally* EX1002. The U.S. Patent and Trademark Office ("PTO") made no substantive rejection of the claims during prosecution. EX1002, 128-130. On August 28, 2009, the PTO concluded that the claimed invention was patentable

and issued a Notice of Allowance, indicating that the prior art failed to show all of the features of claim 1. EX1002, 23-24.

C. Claims Of The '473 Patent

54. Petitioner has challenged claims 1, 6-9, and 11-24 of the '473 Patent, of which claim 1 is the sole independent claim (the "Challenged Claims").

55. Independent claim 1 recites:

1. A vegetable fat composition comprising glycerides, wherein the triglyceride content of the composition is:

6 to 20% SSS,

5 to less than 20% SUS

5 to less than 25% SSU

10 to 39 SU₂ and

at least 20% U₃,

wherein S is a saturated fatty acid residue having 16 to 24 carbon atoms and U is an unsaturated fatty acid residue having at least 18 carbon atoms and all percentages are by weight based on the total triglycerides present in the composition,

the weight ratio SUS/SSU is between 0.5 and 2.0,

the weight ratio of (saturated fatty acid residues having 18 to 24 carbon atoms)/(saturated fatty acid residues having 16 carbon atoms)

in the total S content of the triglycerides is less than 0.2,

and the triglycerides contain less than 3% of arachidic and behenic acid residues based on the total fatty acid residue content of the triglycerides,

and wherein the saturated fatty acid residue content of the triglycerides is less than 45% by weight of the total fatty acid residues in the triglycerides.

EX1001, 7:20-41.

56. Claims 6-9 and 11-24 ultimately depend from claim 1. EX1001, 7:56-8:10, 8:18-47.

VI. GROUND SUMMARY

57. I have been advised by counsel and understand that a Petition for *Inter Partes* Review was filed against claims 1, 6-9, and 11-24 of the '473 Patent on August 28, 2024 (IPR2024-01360, Paper 2). I understand that this Petition seeks cancellation of claims 1, 6-9, and 11-24 of the '473 Patent on the following Grounds:

Ground	Claims Challenged	Basis 35 U.S.C. §	Reference(s)
1	1, 6-9, 11-17, 20	103	Petrauskaite (EX1007)
2	18, 19, 21-24	103	Petrauskaite in view of Idris (EX1009)

See Petition, 3.

VII. CLAIM CONSTRUCTION

58. I have been advised by counsel and understand that in interpreting claims, I should consider the literal language of the claim at issue, as well as the language of other claims, the specification, and the prosecution history

of the underlying claims. Counsel has also advised me and I understand that the words of a claim should be given their ordinary meaning as understood by those of ordinary skill in the art, unless it is clear from the specification or prosecution history (or both) that a different meaning was intended.

59. The Petition mentions some claim constructions. Petition, 10-12. For purposes of this Declaration only, I do not believe that claim construction discussion impacts the opinions I offer here, so I do not address it. I do not believe that any formal constructions are necessary for the analysis set forth in this Declaration, but some explanation of the technology field may be helpful.

A. Technology Overview

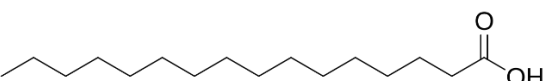
60. A lipid is an organic compound such as a fat or oil, which has repeating units of fatty acids. Fatty acids are organic compounds that possess a carboxylic acid and a long hydrocarbon chain. They have the general chemical formula $\text{CH}_3(\text{CH}_2)_n\text{COOH}$, where n primarily ranges from 10 to 18 in plant oils and is almost always an even number.

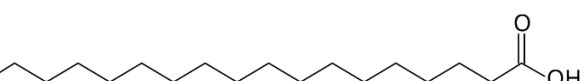
61. There are two types of fatty acids: saturated fatty acids and unsaturated fatty acids. In saturated fatty acids, the hydrocarbon chain contains only single bonds between carbon atoms and each carbon is bonded to the maximum number of hydrogen atoms that can be accommodated (*i.e.*, the fatty acid molecule is saturated in hydrogen). In unsaturated fatty acids, the carbon atoms are not

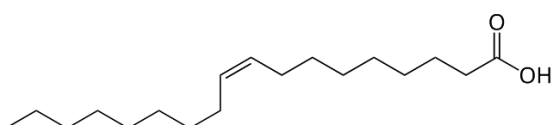
bonded to the maximum number of hydrogen atoms due to the presence of one or more double bonds between carbons in the hydrocarbon chain.

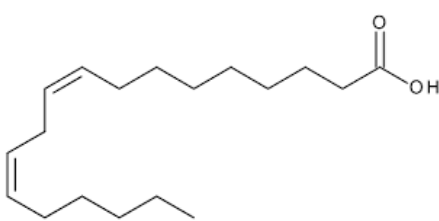
62. Unsaturated fatty acids can be monounsaturated, meaning they have one double bond, or polyunsaturated, meaning they have more than one double bond.

63. Fatty acids are often represented as a ratio of the number of carbons:number of double bonds. For example, palmitic acid would be represented with 16:0, because it contains 16 carbons and 0 double bonds. Examples of saturated and unsaturated fatty acids are as follows:

Palmitic Acid (saturated fatty acid, 16:0): 

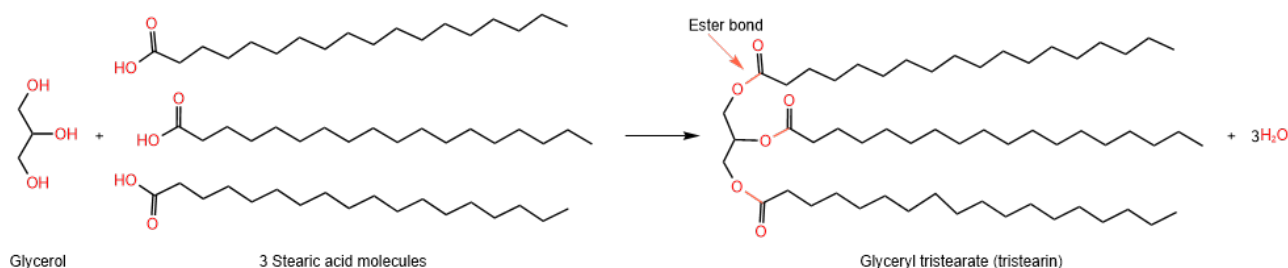
Stearic Acid (saturated fatty acid, 18:0): 

Oleic Acid (unsaturated fatty acid, 18:1): 

Linoleic Acid (unsaturated fatty acid, 18:2): 

64. A triglyceride is a triester derived from the condensation of glycerol and three fatty acids, and is said to contain three fatty acid residues. The

fatty acids that condense with glycerol can all be identical, two can be the same, or all three can be different. The condensation of three stearic acid molecules with glycerol to form a triglyceride is shown in the following diagram:



Since the triglyceride shown above is derived from three saturated fatty acids, it represents an example of a SSS triglyceride, as recited in claim 1 of the '473 Patent. Alternatively, a triglyceride derived from only unsaturated fatty acids could be referred to as U₃ or UUU. A triglyceride derived from two saturated fatty acids and one unsaturated fatty acid could be referred to as S₂U (SUS, SSU, or USS). A triglyceride derived from one saturated fatty acid and two unsaturated fatty acids could be referred to as U₂S (UUS, USU, or SUU). The SSS, SUS, SSU, SU₂, and U₃ nomenclature is used in claim 1 of the '473 Patent.

65. The relative amounts of different triglycerides present in a fat composition can be characterized by their weight in terms of weight % or wt%. Thus, a fat composition comprising 6 to 20% SSS triglycerides contains 6 to 20% by weight of all triglycerides in the form of SSS triglycerides.

VIII. SCOPE AND CONTENT OF PRIOR ART

A. Summary Of Petrauskaite (EX1007)

66. The sole reference cited by Petitioner in asserting unpatentability of claims 1, 6-9, 11-17, and 20 of the '473 Patent is the publication of Petrauskaite et al., “Physical and Chemical Properties of Trans-Free Fats Produced by Chemical Interesterification of Vegetable Oil Blends,” *Journal of the American Oil Chemists’ Society* 75(4):489-493 (1998) (“Petrauskaite”). Petrauskaite relates generally to the “physical and chemical properties of *trans*-free fats produced by chemical interesterification of vegetable oil blends.” EX1007, Title. In particular, Petrauskaite focuses on “[f]at blends, formulated by mixing a highly saturated fat (palm stearin or fully hydrogenated soybean oil) with a native vegetable oil (soybean oil) in different ratios from 10:90 to 75:25 (wt%)...[and] subjected to chemical interesterification reactions...” EX1007, Abstract. “Starting and interesterified blends were investigated for triglyceride composition, solid fat content, free fatty acid content, and *trans* fatty acid (TFA) levels.” EX1007, Abstract.

67. Petrauskaite discloses that “[t]he interesterified blends with 30-50% of hard stock had plasticity curves in the range of commercial shortenings and stick-type margarines, while interesterified blends with 20% hard stock were suitable for use in soft tub-type margarines. Confectionery fat basestocks could be

prepared from interesterified fat blends with 40% palm stearin or 25% fully hydrogenated soybean oil.” EX1007, Abstract.

B. Summary Of Idris (EX1009)

68. Petitioner’s assertion of unpatentability of claims 18, 19, and 21-24, which ultimately depend from claim 1, relies on a combination of Petrauskaite and Idris et al., “Evaluation of Shortenings Based on Various Palm Oil Products,” *Journal of the Science of Food and Agriculture* 46(4):481-493 (1989) (“Idris”). Idris relates generally to an “evaluation of shortenings based on various palm oil products.” EX1009, Title. In particular, Idris focuses on “formulations based on blends of hydrogenated palm oil (MP 41.5°C) and palm stearin (IV 44) with other liquid oils, on direct blends of palm stearin with other liquid oils, and on 100% interesterified palm olein...used as feedstocks in shortening production.” EX1009, Abstract. “Physicochemical characteristics, creaming properties and baking performance of the shortenings were evaluated and compared with the best shortening on the market.” EX1009, Abstract.

69. Petitioner and Dr. Marangoni do not rely on Idris for teaching any of the limitations of claim 1 (which limitations are incorporated into claims 18, 19, and 21-24). Idris is only relied on for the additional limitations set forth in claims 18, 19, and 21-24.

IX. CLAIMS 1, 6-9, 11-17, AND 20 ARE VALID OVER PETRAUSKAITE

A. Claims 1, 6-9, 11-17, And 20 Would Not Have Been Obvious Over Petruskaite In View Of Knowledge Generally Available In The Art

1. Dr. Marangoni's Declaration Fails to Show That Petruskaite Meets the Triglyceride Content Limitations of Claim 1 of the '473 Patent

70. The Petition asserts invalidity of claim 1 and claims 6-9, 11-17, and 20 that depend from claim 1, based on Petruskaite, supposedly in view of knowledge generally available in the art.

71. It is my opinion that the Petition and Dr. Marangoni's Declaration fail to show that Petruskaite in view of knowledge generally available in the art teaches or suggests the limitations of claims 1, 6-9, 11-17, and 20 of the '473 Patent. In particular, the Petition fails to show that Petruskaite, in view of knowledge generally available in the art, teaches or suggests the weight percent (wt%) values of the triglycerides recited in the composition of claim 1 (*i.e.*, 6-20% SSS, 5 to less than 20% SUS, 5 to less than 25% SSU, 10 to 39%¹ SU₂, and at least 20% U₃).

¹ Claim 1 of the '473 Patent appears to possess a typographical error, which I believe has no impact on the meaning of the claim. Specifically, there is no “%” symbol following the “10 to 39 SU₂” value recited in the claim. I read the “10 to 39 SU₂”

72. The Petition's invalidity assertions rely entirely on a calculation detailed in the Marangoni Declaration. In that declaration, Dr. Marangoni acknowledges that "Petrauskaite is silent with respect to the wt% of the listed triglycerides." EX1003, para [59]. I agree. Petrauskaite is silent with respect to the *weight percent* ("wt%") of any triglyceride content of any fat composition it discloses. Instead of teaching a fat composition with a triglyceride content stated in wt% as required by claim 1 of the '473 Patent, Petrauskaite describes fat compositions with U₃, U₂S, and S₃ triglyceride content in terms of *mole percent* values ("mole%"). EX1007, Table 2.

73. Since Petrauskaite describes fat compositions in terms of mole% rather than wt%, Petitioner argues that Petrauskaite's mole% triglyceride values can be converted, using general knowledge in the art, into wt% triglyceride values. Dr. Marangoni does this to try to show that the wt% values recited in claim 1 are disclosed in Petrauskaite's fat compositions in terms of mole percent. EX1003, paras [61]-[87]. I disagree with this contention. Further, it is apparent that Petitioner is arguing that Petrauskaite's fat compositions would inherently disclose the claimed

value as being a weight % value like the other triglyceride values recited in the claim. This meaning is clear and logical to me.

wt% values. However, Petitioner and Dr. Marangoni avoid any reference to inherency.

74. Petitioner's arguments are based on a series of assumptions and calculations described in the Marangoni Declaration. I take issue with Dr. Marangoni's reliance on: (i) specific disclosures in certain references to supplement the teachings of Petrauskaite, because they do not represent knowledge generally available in the art; (ii) an assumption of random interesterification, when Petrauskaite itself shows that interesterification is not completely random; and (iii) a number of other flawed assumptions Dr. Marangoni makes pertaining to chemical compositions of lipids.

75. As described in detail below, these are critical flaws in Dr. Marangoni's assertion that claims 1, 6-9, 11-17, and 20 of the '473 Patent would have been obvious in view of Petrauskaite and knowledge generally available in the art. As a result of these flaws, I do not believe Petrauskaite's fat compositions disclose the triglyceride content recited in the fat composition of claim 1. Since claims 6-9, 11-17, and 20, depend from claim 1, those claims likewise would not have been obvious in view of Petrauskaite.

76. In fact, as I describe in more detail below, when Dr. Marangoni's calculations are performed using values expressly disclosed in Petrauskaite and that are actually consistent with some of his key assumptions, his own mathematical

formulas yield triglyceride composition values **outside** the scope of claim 1 of the '473 Patent.

77. Consequently, I disagree with Petitioner and Dr. Marangoni.

**a. Dr. Marangoni's Triglyceride Content Calculations
Are Flawed Because They Do Not Account for
Differences in Fat Inputs**

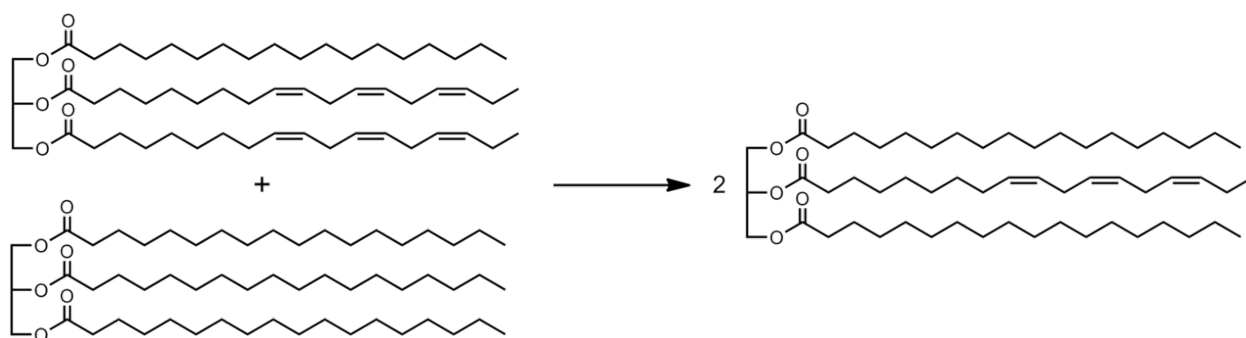
78. The calculations in the Marangoni Declaration are based on compositions disclosed in Petrauskaite, but there are key differences between the compositions disclosed in Petrauskaite and those described in the '473 Patent, which are not accounted for in Dr. Marangoni's calculations.

79. In making its fat compositions, Petrauskaite describes the blending of neutralized bleached soybean oil, fully hydrogenated soybean oil, and palm stearin. EX1007, 489. This fat blend then undergoes an interesterification procedure, where the fat blend is neutralized with 50% caustic soda solution and dried. Sodium methoxide is used as a catalyst. EX1007, 489-490.

80. As described in Petrauskaite, interesterification is "one of the alternatives to the partial hydrogenation process that can be used to give fats and oils desired functionality." EX1007, 489, right col. Interesterification of triglycerides is a chemical process where the fatty acid residues within two or more triglyceride molecules are rearranged, effectively "swapping" their positions on the glycerol backbone to produce a mixture of different triglycerides, thus altering the chemical

and physical properties of the fat, like its molecular weight, melting point, and consistency. *See, e.g.*, Gurr et al., “Lipids in Foods,” in *Lipid Biochemistry*, 5th ed, Osney Mead, Oxford: Blackwell Science, pp. 131-132 (2002) (“Gurr”) (**EX2003**).

81. An illustrative example of interesterification between a SSS triglyceride and a SUU triglyceride, resulting in the production of a SUS triglyceride, is shown in the following schematic illustration:



As can be seen from the above illustration, when the two triglycerides on the left (*i.e.*, SUU and SSS) are interesterified, the result is the creation of a SUS triglyceride. Other triglycerides could also be generated in the example above, depending on how the interesterification process is carried out. Interesterification involves rearranging the fatty acids in a triglyceride to produce different quantities of triglycerides in a fat composition.

82. The process of chemical interesterification is generally known among food and lipid chemists as involving treatment of a fat or fat blend with a catalyst (*e.g.*, sodium methoxide) at an elevated temperature to randomize the fatty

acids among the triacylglycerol molecules, as distinct from their natural stereo-specific distribution. *See, e.g.*, EX2003, 131-132 (Gurr).

83. In Petrauskaite, palm stearin and soybean oil are first blended together, and the blend is then interesterified. EX1007, 489-490.

84. In contrast, in the '473 Patent, the inventive composition is made by blending: (i) an already-interesterified palm olein; and (ii) a palm oil fraction with a SUS-content of less than 50 wt% and an SSS-content of at least 20%. '473 Patent, 2:60-64, 3:6-15, 4:43-49, 5:41-49.

85. The difference in how these fat compositions are made and when the individual components or blends are interesterified is important, because the interesterification process changes the content of the triglycerides in the composition. For example, Petrauskaite uses an intended random interesterification of several fats blended together (although the data reported in Petrauskaite Table 2 show the results are not completely random). This results in a TAG composition that approaches all of the potential combinations of fatty acids on the TAG. However, the '473 Patent uses uninteresterified and interesterified fats blended together. The uninteresterified fats would not have random fatty acid distributions on the glycerol backbone in the same manner as the interesterified fats because the naturally occurring fatty acid positions are not randomly distributed on the TAG.

Therefore, calculations based on intended randomization are problematic when using blends of uninteresterified and interesterified fats.

86. The Marangoni Declaration does not address this key difference or account for it in its analysis and calculations. Dr. Marangoni's failure to account for this difference between the '473 Patent and Petrauskaite undermines his assertion that a POSITA would have looked to Petrauskaite.

b. Dr. Marangoni's Triglyceride Content Calculations Are Flawed Because His Input Values Are Not Representative of General Knowledge in the Art

87. The first step in Dr. Marangoni's calculations for converting Petrauskaite's triglyceride mole% values to wt% values was to determine the average molecular weight of saturated (S) and unsaturated (U) fatty acids in the individual components of the Petrauskaite composition (*i.e.*, 100% palm stearin ("Pst") and 100% soybean oil ("SBO")) of Petrauskaite's 40:60 Pst/SBO and 50:50 Pst/SBO fat blends. EX1003, para [62].

88. To do this, the molecular weight of the individual fatty acids of which palm stearin and soybean oil are composed, as well as their relative amounts, had to be determined from a source other than Petrauskaite, because Petrauskaite does not describe those values. Thus, Dr. Marangoni turned to what he refers to as "knowledge generally available in the art." EX1003, para [59].

89. For the wt% of individual fatty acids in palm stearin, Dr. Marangoni relies on Deffense, “Fractionation of Palm Oil,” *Journal of the American Oil Chemists’ Society* 62(2):376-385 (1985) (“Deffense”) (EX1014), which discloses in Table IV a composition comprising 68.8% palmitic acid, 5.1% stearic acid, 19.1% oleic acid, and 4.5% linoleic acid, described in Table 1 of EX1003, para [63]. I have been advised by counsel and understand that the Deffense reference is not listed as part of the invalidity grounds set forth in the Petition.

90. For the wt% of individual fatty acids in soybean oil, Dr. Marangoni relies on Neff et al., “Oxidative Stability of Blends and Interesterified Blends of Soybean Oil and Palm Olein,” *Journal of the American Oil Chemists’ Society*, 71(10):1111-1116 (1994) (“Neff”) (EX1011), which discloses in Table 1 a soybean oil composition comprising 10% palmitic acid, 4.2% stearic acid, 25.4% oleic acid, 53.4% linoleic acid, and 7% linolenic acid, described in Table 2 of EX1003, para [65]. Again, I have been advised that the Neff reference is not listed as part of the invalidity grounds set forth in the Petition.

91. Dr. Marangoni does not explain why the two specific references he relies on represent knowledge generally available in the art beyond stating that their disclosures were known. See EX1003, paras [63] and [65]. He likewise does not explain why a POSITA would have considered those two specific references in the context of Petrauskaite’s disclosure. In my opinion, it would not have been

obvious to a POSITA to select these two specific references given that it is well known that the fatty acid profiles of agricultural raw materials like palm stearin and soybean oil are variable. It is generally known that the fatty acid profile of the raw materials changes due to a number of factors, for example, differences in plant varieties, differences in agricultural practices impacting the composition of the oils, differences in processing techniques (refining and/or fractionation in case of palm stearin), and the geographic origin of the raw material.

92. I note that Deffense discloses that palm stearin is a fat mainly made up of the following fatty acids: (i) palmitic acid; (ii) stearic acid; (iii) oleic acid; and (iv) linoleic acid. EX1014, 377 (Table 1). Among these fatty acid components of palm stearin, it is general knowledge in the art that:

- palmitic acid is a saturated fatty acid with 16 carbon atoms (16:0);
- stearic acid is a saturated fatty acid with 18 carbon atoms (18:0);
- oleic acid is a mono-unsaturated fatty acid with 18 carbons (18:1); and
- linoleic acid is a polyunsaturated fatty acid with 18 carbons (18:2).

The following Table 1 summarizes the content of the major fatty acids in palm stearin. It is noted that, according to Deffense, there are 2.5% unidentified fatty acids in palm stearin, which could be fatty acids other than palmitic acid, stearic acid, oleic acid, or linoleic acid, which would influence the TAG composition of palm stearin.

Table 1. Fatty Acid Composition of Palm Stearin

Palm Stearin				
Fatty Acid	Palmitic acid	Stearic acid	Oleic acid	Linoleic acid
Type	Saturated (16:0)	Saturated (18:0)	Mono-unsaturated (18:1)	Polyunsaturated (18:2)

93. As can be seen from Table 1, palm stearin comprises 4 different major fatty acids, two of which are saturated and two of which are unsaturated.

94. Thus, in determining the wt% of triglycerides in a fat, such as palm stearin, or a fat composition comprising more than one kind of fat, it is important to know the precise amount of each fatty acid in each fat. Otherwise, the calculation of wt% of triglycerides in a composition will be inaccurate. Since palm stearin comprises both saturated and unsaturated fatty acids, the amount of each type of fatty acid is important because different amounts of saturated or unsaturated fatty acids translates to a difference in TAG composition.

95. The fatty acid composition values relied on by Dr. Marangoni from Deffense Table IV represent **only one** example of the wt% of individual fatty acids in palm stearin. As I understand, palm stearin was well known to have different compositional values from those presented in Deffense Table IV and the Marangoni Declaration.

96. As of the Critical Date, it was widely known and accepted in the art that palm stearin comprises a range in the amount of each of the fatty acids that make up that fat. Indeed, other values for the wt% of the individual fatty acids in palm stearin were generally known and accepted in the art. In fact, Deffense itself discloses fatty acid compositions for several different sources of palm stearins, all with varying wt% of individual fatty acids. *See* EX1014, 490-492 (Tables I-IV). Dr. Marangoni does not explain or address why he relied on the specific wt% of fatty acids in palm stearin disclosed in Table IV of Deffense as opposed to those in Tables I-III of Deffense or any other references for palm stearin.

97. As an example of other references, Lin, “Palm Oil,” in Gunstone, ed., *Vegetable Oils in Food Technology: Composition Properties and Uses*, Boca Raton, Florida: CRC Press LLC, pp. 59-97 (2002) (“Lin”) (**EX2005**), at 67 (Table 3.6), teaches that the fatty acid composition of palm stearin ranges from 47.2-73.8% palmitic acid, 4.4-5.6% stearin acid, 15.6-37.0% oleic acid, and 3.2-9.8% linoleic acid. In yet another example, Rossell et al., “Composition of Oil,” *Journal of the American Oil Chemists’ Society*, 62(2):221-230 (1985) (“Rossell”) (**EX2006**), at 223 (Table II), reports the following fatty acid composition of palm stearin: 46.5-68.9% palmitic acid, 4.4-5.5% stearic acid, 19.9-38.4% oleic acid, and 4.1-9.3% linoleic acid.

98. The following Table 2 summarizes three different wt% values of the fatty acid composition of palm stearin that were generally known in the art, as confirmed by Deffense, Lin, and Rossell.

Table 2. Fatty Acid Composition Values for Palm Stearin

Reference	Palmitic Acid (16:0)	Stearic acid (18:0)	Oleic acid (18:1)	Linoleic acid (18:2)
Deffense Table IV	68.8%	5.1%	19.1%	4.5%
Lin	47.2-73.8%	4.4-5.6%	15.6- 37.0%	3.2-9.8%
Rossell	46.5-68.9%	4.4-5.5%	19.9- 38.4%	4.1-9.3%

99. As can be seen from Table 2 above, the amount of each of the four fatty acids that make up palm stearin was broadly understood to represent a range of values. The Marangoni Declaration relies on only the specific values in Deffense Table IV as the knowledge generally available in the art. See EX1003, para [63]. Not only does Dr. Marangoni fail to mention that ranges in values were widely known in the art, but he also fails to address how these compositional differences in the fatty acid content of palm stearin could impact his calculations.

100. The same problem exists for soybean oil. Soybean oil is a fat made up primarily of the following fatty acids: (i) linoleic acid; (ii) alpha-linolenic acid; (iii) oleic acid; (iv) palmitic acid; and (v) stearic acid. Among these fatty acid components of soybean oil, it is widely known and accepted that:

- linoleic acid is a polyunsaturated fatty acid with 18 carbons and two double bonds (18:2);
- alpha-linolenic acid is a polyunsaturated fatty acid with 18 carbons and three double bonds (18:3);
- oleic acid is a mono-unsaturated fatty acid (18:1);
- palmitic acid is a saturated fatty acid with 16 carbon atoms (16:0);
and
- stearic acid is a saturated fatty acid with 18 carbon atoms (18:0).

The following Table 3 summarizes the fatty acid content of soybean oil.

Table 3. Fatty Acid Composition of Soybean Oil

Soybean Oil					
Fatty Acid	Linoleic acid	Alpha-linolenic acid	Oleic acid	Palmitic acid	Stearic acid
Type	Polyunsaturated (18:2)	Polyunsaturated (18:3)	Mono-unsaturated (18:1)	Saturated (16:0)	Saturated (18:0)

101. As can be seen from Table 3, soybean oil comprises primarily of 5 different fatty acids, two of which are saturated and three of which are unsaturated.

102. Thus, in determining the wt% composition of triglycerides in a fat, such as soybean oil, or a fat composition comprising more than one kind of fat, it is important to know the precise amount of each fatty acid in each fat. Otherwise, the calculation of wt% of fatty acids in a composition will be inaccurate. Since soybean oil comprises both saturated and unsaturated fatty acids, the amount of each type of fatty acid is important because different amounts of saturated or unsaturated fatty acids translates to a difference in TAG composition.

103. The fatty acid composition values relied on by Dr. Marangoni from Neff represent **only one** example of the wt% of individual fatty acids in

soybean oil. Soybean oil was known to have different compositional values from those presented in Neff and the Marangoni Declaration.

104. As of the Critical Date, it was widely known and accepted in the art that soybean oil comprises a range in the amount of each of the fatty acids that make up that fat. Indeed, other values for the fatty acid composition in soybean oil were generally known and accepted in the art. Dr. Marangoni does not address or explain why he relied on the wt% of fatty acid in soybean oil disclosed in Neff as opposed to any other references for soybean oil.

105. As an example, Wang, “Soybean Oil,” in Gunstone ed., *Vegetable Oils in Food Technology: Composition Properties and Uses*, Boca Raton, Florida: CRC Press LLC, pp. 18-58 (2002) (“Wang”) (**EX2004**), at 21 (Table 2.3), describes the fatty acid composition of soybean oil as 11.0% palmitic acid, 4.0% stearic acid, 23.4% oleic acid, 53.2% linoleic acid, and 7.8% linolenic acid. In yet another example, FAO and WHO. 1999. Standard for Named Vegetable Oils. Codex Alimentarius Standard, No. CXS 210-1999. Codex Alimentarius Commission. Rome. (“Codex Stan”) (**EX2007**), at 6 (Table 1) describes the composition of the major fatty acids of soybean oil as 8.0-13.5% palmitic acid, 2.0-5.4% stearic acid, 17-30% oleic acid, 48.0-59.0% linoleic acid, and 4.5-11.0% linolenic acid.

106. The following Table 4 summarizes the different molecular wt% values of the fatty acid composition of soybean oil that were generally known in the art, as confirmed by Neff, Wang, and Codex Stan.

Table 4. Fatty Acid Composition Values for Soybean Oil

Reference	Linoleic acid (18:2)	Linolenic acid (18:3)	Oleic acid (18:1)	Palmitic Acid (16:0)	Stearic acid (18:0)
Neff	53.4%	7%	25.4%	10%	4.2%
Wang	53.2%	7.8%	23.4%	11.0%	4.0%
Codex Stan	48.0-59.0%	4.5-11.0%	17-30%	8.0-13.5%	2.0-5.4%

107. As can be seen from Table 4 above, the amount of each of the five fatty acids that make up soybean oil were generally known in the art to represent a range of values. Dr. Marangoni not only fails to mention that ranges in values were widely known in the art, but he also never addresses how compositional differences in the fatty acid content of soybean oil could impact his calculations.

108. Based on the fatty acid wt% values shown in Table 2 and Table 4 above, I disagree with Dr. Marangoni's contention that the values relied on in his calculations accurately reflect the knowledge generally available in the art. Not only does Dr. Marangoni not explain why he selected the particular values he relies on

(beyond stating they were known), but also he fails to address that they are just one set of values from a wider range of values that were generally known in the art at the Critical Date. Dr. Marangoni also does not explain how variations in these values might impact his triglyceride wt% calculations.

109. Dr. Marangoni's calculations converting the mole% amounts of the fat defined in claim 1 of the '473 Patent depend on the wt% fatty acid values he derives from Deffense Table IV and Neff. Dr. Marangoni relies on disclosures from Deffense Table IV and Neff to infer that their wt% are representative of palm stearin and soybean oil. Given that generally available knowledge in the art encompassed ranges and values different from the ones Dr. Marangoni relied on, it is apparent that Dr. Marangoni is relying on the specific disclosures in Deffense and Neff, not the general knowledge in the art.

c. Dr. Marangoni's Further Calculations

110. In the following paragraphs, I discuss Dr. Marangoni's calculations and how his assumptions regarding wt% values impact his results.

111. Dr. Marangoni calculates the average molecular weight of saturated and unsaturated fatty acids in both 100% palm stearin and 100% soybean oil using the molecular weights of the individual fatty acids and the wt% values derived from Deffense Table IV and Neff, respectively. EX1003, paras [64] and [66]. This is done by multiplying the relative proportions of each fatty acid by their

respective molecular weight and adding these values together to get an average molecular weight. The relative proportion of each saturated fatty acid is calculated by dividing its wt% by the combined wt% of all the saturated fatty acids in that particular fat (*i.e.*, palm stearin or soybean oil).

112. The relative proportion of each unsaturated fatty acid is calculated by dividing its wt% by the combined wt% of all the unsaturated fatty acids in that particular fat (*i.e.*, palm stearin or soybean oil). For example, palm stearin contains two saturated fatty acids, palmitic acid and stearic acid. The proportion of palmitic acid in palm stearin would be calculated by dividing its wt% by the combined wt% of palmitic acid and stearic acid, and the proportion of stearic acid in palm stearin is calculated by dividing its wt% by the combined wt% of palmitic acid and stearic acid. Palm stearin contains two unsaturated fatty acids, oleic acid and linoleic acid, so the proportion of oleic acid in palm stearin is calculated by dividing its wt% by the combined wt% of oleic acid and linoleic acid, and the proportion of linoleic acid is calculated by dividing its wt% by the combined wt% of oleic acid and linoleic acid.

113. The equations used by Dr. Marangoni for calculating the average molecular weight for both saturated and unsaturated fatty acids in 100% palm stearin, are as follows (*see* EX1003, para [62]):

Avg. Mol. Wt. for Saturated fatty acids

$$= (\text{Mol. Wt. Palmitic Acid}) * \text{wt\% Palmitic acid} / (\text{total wt\% of Saturated fatty acids}) + (\text{Mol. Wt. Stearic Acid}) * \text{wt\% Stearic acid} / (\text{total wt\% of Saturated fatty acids})$$

Avg. Mol. Wt. for Unsaturated fatty acids

$$= (\text{Mol. Wt. Oleic Acid}) * \text{wt\% Oleic Acid} / (\text{total wt\% of Unsaturated fatty acids}) + (\text{Mol. Wt. Linoleic Acid}) * \text{wt\% Linoleic acid} / (\text{total wt\% of Unsaturated fatty acids})$$

114. Using these equations and the wt% values from Deffense, the average molecular weight for *saturated* fatty acids in 100% palm stearin was calculated by Dr. Marangoni to be 258.4 g/mol and the average molecular weight for *unsaturated* fatty acids in 100% palm stearin was calculated to be 282.1 g/mol. EX1003, para [64], reproduced below:

Avg. Mol. Wt for Saturated Fatty Acids =

$$\left(256.42 \frac{\text{g}}{\text{mol}}\right) * \frac{68.8}{(68.8 + 5.1)} + \left(284.47 \frac{\text{g}}{\text{mol}}\right) * \frac{5.1}{(68.8 + 5.1)} = 258.4 \frac{\text{g}}{\text{mol}} \text{ saturated fatty acid}$$

Avg. Mol. Wt for Unsaturated Fatty Acids

$$\begin{aligned} &= \left(282.44 \frac{\text{g}}{\text{mol}}\right) * \frac{19.1}{(19.1 + 4.5)} + \left(280.43 \frac{\text{g}}{\text{mol}}\right) * \frac{4.5}{(19.1 + 4.5)} \\ &= 282.1 \frac{\text{g}}{\text{mol}} \text{ unsaturated fatty acid} \end{aligned}$$

115. The average molecular weight of saturated and unsaturated fatty acids in soybean oil is calculated using the same approach described above. Soybean oil contains two *saturated* fatty acids, palmitic acid and stearic acid, and three *unsaturated* fatty acids, oleic acid, linoleic acid, and linolenic acid. The equations used for calculating the average molecular weight for both saturated and unsaturated fatty acids in 100% soybean oil are as follows (*see* EX1003, para [66]):

Avg. Mol. Wt. for Saturated Fatty Acids

$$= (\text{Mol. Wt. of Palmitic Acid}) * \text{wt\% of Palmitic acid} / (\text{total wt\% of Saturated fatty acids}) + (\text{Mol. Wt. of Stearic Acid}) * \text{wt\% of Stearic acid} / (\text{total wt\% of Saturated fatty acids})$$

Avg. Mol. Wt. for Unsaturated Fatty Acids

$$= (\text{Mol. Wt. of Oleic Acid}) * \text{wt\% of Oleic Acid} / (\text{total wt\% of Unsaturated fatty acids}) + (\text{Mol. Wt. of Linoleic Acid}) * \text{wt\% Linoleic acid} / (\text{total wt\% of Unsaturated fatty acids}) + (\text{Mol. Wt. of Linolenic Acid}) * \text{wt\% of Linolenic acid} / (\text{total wt\% of Unsaturated fatty acids})$$

116. Using these equations and the wt% from Neff, Dr. Marangoni calculated the average molecular weight for *saturated* fatty acids to be 264.7 g/mol

and the average molecular weight for *unsaturated* fatty acids to be 280.8 g/mol.

EX1003, para [66], reproduced below:

Avg. Mol. Wt for Saturated Fatty Acids

$$\begin{aligned} & \left(256.42 \frac{\text{g}}{\text{mol}}\right) * \frac{10.0}{(10.0 + 4.2)} + \left(284.47 \frac{\text{g}}{\text{mol}}\right) * \frac{4.2}{(10.0 + 4.2)} \\ & = 264.7 \frac{\text{g}}{\text{mol}} \text{ saturated fatty acid} \end{aligned}$$

Avg. Mol. Wt for Unsaturated Fatty Acids

$$\begin{aligned} & \left(282.44 \frac{\text{g}}{\text{mol}}\right) * \frac{25.4}{(25.4 + 53.4 + 7.0)} + \left(280.43 \frac{\text{g}}{\text{mol}}\right) * \frac{53.4}{(25.4 + 53.4 + 7.0)} + (278.41) \\ & * \frac{7.0}{(25.4 + 53.4 + 7.0)} = 280.8 \frac{\text{g}}{\text{mol}} \end{aligned}$$

117. This first step in Dr. Marangoni's calculation is determining the average molecular weights of saturated and unsaturated fatty acids in both 100% palm stearin and 100% soybean oil based on the wt% values derived from Deffense Table IV and Neff, respectively. I disagree with Dr. Marangoni's inputs to these calculations because the fatty acid compositions of palm stearin and soybean oil were known to be variable, as discussed above. Since these first calculations rely on the specific wt% values taken only from Neff and Deffense Table IV, respectively, and because these calculated average molecular weights are the basis of the next steps in Dr. Marangoni's calculations, the results achieved by Dr. Marangoni cannot be trusted to show that Petrauskaite's composition falls within the

wt% values of claim 1 of the '473 Patent. This is because Neff and Deffense Table IV do not represent the knowledge generally available in the art for the reasons discussed above.

118. For the reasons discussed above, a POSITA would have known that as of the Critical Date the fatty acid wt% disclosed in Deffense Table IV and Neff for palm stearin and soybean, respectively, do not represent the knowledge generally available in the art. A POSITA would have known that the knowledge generally available in the art was more than just what was represented in Deffense Table IV and Neff. A POSITA would have also addressed how these variations might impact calculations like the ones done by Dr. Marangoni. Dr. Marangoni failed to address these issues. Likewise, instead of relying on alleged general knowledge in the art, Petitioner could have stated that it was relying on the specific disclosures in Deffense Table IV and Neff, and discussed why a POSITA would have been motivated to combine the teachings of Petrauskaite with those specific references. Petitioner and Dr. Marangoni did neither of the above.

119. All the subsequent steps in Dr. Marangoni's calculations are based on and flow from the first step in his calculation discussed above.

120. As discussed above, all of these calculations utilize and stem from the assertion that Neff and Deffense Table IV represent the general knowledge in the art.

121. As stated above, Dr. Marangoni relied on values taken from Deffense Table IV and Neff based on the assertion that they represent general knowledge in the art. However, several other values are also representative of knowledge generally available in the art. Dr. Marangoni not only fails to mention that fact, but also he does not address how those variations might impact calculations like the ones presented in his declaration. (*see* Table 2 and Table 4, *supra*).

d. Dr. Marangoni's Triglyceride Content Calculations Are Flawed Because His Assumptions Are Inconsistent with the Values He Uses in His Calculations

122. Beyond the issues discussed above, Dr. Marangoni also builds into his invalidity assertions other erroneous assumptions that contradict his conclusions and calculations, and demonstrate that the fat blends described in Petrauskaite do not meet the triglyceride limitations of claim 1 of the '473 Patent.

123. The first of these is an assumption Dr. Marangoni makes about interesterification. Specifically, Dr. Marangoni assumes that interesterification occurs with randomization:

82. As discussed above for Element [1.1], the fatty acid composition of palm stearin and soybean oil are well-known. The randomized distribution of fatty acids in triglyceride molecules of interesterified fats and oils was also well-known in the art. For example, Hustedt states that “[a]fter interesterification of an

ester, the random distribution occurs whereby in the molecule type GS_2U 2/3 of the unsaturated acid appears in position 1 and 1/3 in position 2.” EX1008, 391. Thus, the mol% of SUS and SSU can be calculated from S_2U for interesterified compositions. Here, the mol% of SUS is 1/3 of the mol% of S_2U .

EX1003, para [82].

124. This is an important assumption, because interesterification is known to not occur with complete randomization. This could be due to differences in hydrolysis and interesterification rates of different fatty acids and different positions within the TAG. In addition, loss of components such as free fatty acids and monoglycerides, during the refining that is used after interesterification, could also change TAG compositions so they do not achieve complete randomization. Indeed, Petrauskaite itself confirms that interesterification is not completely random.

125. Table 2 of Petrauskaite shows the mole% for the triglycerides UUU, SU_2 , and SSS (*see* EX1007, 490 (Table 2)):

- before interesterification (B);
- after interesterification (I); and
- calculated according to Random Distribution Hypothesis (C).

The calculated values (EX1007, 490 (Table 2, Col. C)) are different from the experimentally determined values after interesterification (EX1007, 490 (Table 2,

Col. I)). What this confirms is that Petrauskaite's interesterification process occurs without complete randomization. If interesterification were completely random, the values in columns C and I of Table 2 would not be different. Despite this clear disclosure in Petrauskaite that interesterification is not completely random, Dr. Marangoni nevertheless assumes randomization in his calculations. EX1003, para [82].

126. The impact of this erroneous assumption manifests itself in Dr. Marangoni's calculations. Specifically, Dr. Marangoni uses Petrauskaite's experimentally determined values for the mole% in his calculations (*see* EX1003, para 77 (Table 8), *e.g.*, 21.0 mol % for UUU triglyceride in 50:50 Pst/SBO blend). He does not use the calculated values (EX1007, 490 (Table 2, Col. C)), which would have been the values consistent with Dr. Marangoni's assumption of randomization.

127. The calculated values are consistent with Dr. Marangoni's assumption of randomization because these values were calculated based on Random Distribution Hypothesis, and thus represent the mole% values that would be expected if interesterification occurred with complete randomization, as assumed in Dr. Marangoni's calculation. The experimental values are not consistent with that assumption because those values are different from the values calculated according to Random Distribution Hypothesis, illustrating that the interesterification in Petrauskaite was not completely random.

128. In other words, Dr. Marangoni inputs into his calculations Petrauskaite's experimentally determined values for mole%, despite the fact that those values are inconsistent with his assumption about interesterification, because those values confirm that interesterification is not completely random. Dr. Marangoni's incorrect assumption about interesterification is not supported by Petrauskaite's experimentally determined values, and thus using those values in a calculation based on his assumption is inconsistent and results in an incorrect calculation.

129. To test the impact of Dr. Marangoni's incorrect use of the experimentally derived values (EX1007, 490 (Table 2, Col. I)), rather than the calculated values that would have been consistent with Dr. Marangoni's assumption of randomization (EX1007, 490 (Table 2, Col. C)), below I repeated Dr. Marangoni's calculation using his formulas and using the calculated values disclosed in Petrauskaite. The results confirm that several of the final wt% values calculated from Petrauskaite are outside of the ranges claimed in claim 1 of the '473 Patent.

130. My calculations are shown below, with the substituted values highlighted and in bold font:

Average Total Weight for UUU Triglyceride

$$= (\text{Avg. mol. wt. of UUU triglyceride of 40:60 Pst/SBO blend}) * (\text{Mol \% of UUU triglyceride of 40:60 Pst/SBO blend}) = 882.1 \text{ g/mol} * \mathbf{21.0} = 18,524.1 \text{ g/mol}$$

Average Total Weight for SU₂ Triglyceride

$$= (\text{Avg. mol. wt. of SU}_2 \text{ triglyceride of 40:60 Pst/SBO blend}) * (\text{Mol \% of SU}_2 \text{ triglyceride of 40:60 Pst/SBO blend}) = 862.9 \text{ g/mol} * \mathbf{43.0} = 37,104.7 \text{ g/mol}$$

Average Total Weight for SSS Triglyceride

$$= (\text{Avg. mol. wt. of SSS triglyceride of 40:60 Pst/SBO blend}) * (\text{Mol \% of SSS triglyceride of 40:60 Pst/SBO blend}) = 824.7 \text{ g/mol} * \mathbf{6.7} = 5,525.5 \text{ g/mol}$$

Average Total Weight for S₂U Triglyceride

$$= (\text{Avg. mol. wt. of S}_2\text{U triglyceride of 40:60 Pst/SBO blend}) * (\text{Mol \% of S}_2\text{U triglyceride of 40:60 Pst/SBO blend}) = 843.8 \text{ g/mol} * \mathbf{29.3} = 24,723.3 \text{ g/mol}$$

Total Weight of Triglyceride Species

$$= 18,524.1 + 37,104.7 + 5,525.5 + 24,723.3 = 85,877.6 \text{ g/mol}$$

Weight % for UUU Triglyceride

$$= (18,524.1 / 85,877.6) * 100 = 21.6 \text{ wt\%}$$

Weight % for SU₂ Triglyceride

$$= (37,104.7 / 85,877.6) * 100 = 43.2 \text{ wt\%}$$

Weight % for SSS Triglyceride

$$= (5,525.5 / 85,877.6) * 100 = 6.4 \text{ wt\%}$$

Weight % for S₂U Triglyceride

$$= (24,723.3 / 85,877.6) * 100 = 28.8 \text{ wt\%}$$

131. As one can see from the results of these calculations above, the content of SU₂ triglyceride in the 40:60 interesterified blend of Petrauskaite's

Pst/SBO fat composition is 43.2 wt.%, which is outside the claimed range of 10 to 39% recited in claim 1 of the '473 Patent.

132. I also repeated the above calculations using the calculated mole% for the 50:50 interesterified blend of Petrauskaite's Pst/SBO fat composition, and the results from that calculation also yielded triglyceride values outside the scope of claim 1 of the '473 Patent.

133. Specifically, the contents of triglycerides UUU and SU₂ are 14.8% and 39.6%, respectively, each of which is outside the claimed ranges of at least 20% and 10 to 39%, respectively.

134. My above calculations of wt% of the triglyceride species based on Petrauskaite's calculated values (instead of the experimentally derived values that are inconsistent with his assumption about interesterification) demonstrates that by following Dr. Marangoni's assumption on interesterification as random, the triglyceride values disclosed in Petrauskaite do not meet the limitations of claim 1 of the '473 Patent.

135. Given Dr. Marangoni's own assumption, a POSITA would not have expected a calculation based on Petrauskaite to accurately yield the wt% of the SSS, UUU, SU₂, or S₂U triglyceride species recited in claim 1 of the '473 Patent. This is because, if a POSITA were assuming random interesterification, that

POSITA would have used the calculated values, and those values yield ranges outside claim 1 of the '473 Patent.

136. Further, Dr. Marangoni calculated the mole% of SUS and SSU triglycerides from the mole% of the S₂U triglycerides based on the assumption that interesterification occurs with a random distribution, and thus, for S₂U triglycerides, 2/3 of the unsaturated fatty acid appears in position 1 and 1/3 appears in position 2. EX1003, para [82]. Based on this assumption, Dr. Marangoni calculates the mole% of SUS and SSU from the mole% of S₂U, where the mole% of SUS is 1/3 that of S₂U and the mole % of SSU is 2/3 that of S₂U. EX1003, paras [82] and [90].

137. Dr. Marangoni then calculates the wt% for SUS and SSU using these mole% values. As an example, the calculation of wt% for SUS and SSU for the 40:60 Pst/SBO blend in Petrauskaite is as follows:

Average Mole % of SUS Triglyceride

$$= (\text{Mol \% } S_2U \text{ triglyceride of 40:60 Pst/SBO blend})/3 = 37.1/3 = 12.4 \text{ mol \%}$$

Average Total Weight for SUS Triglyceride

$$= (\text{Avg. mol. wt. of } SU_2 \text{ triglyceride of 40:60 Pst/SBO blend}) * (\text{Mol \% of SUS triglyceride of 40:60 Pst/SBO blend}) = 843.8 \text{ g/mol} * 12.4 = 10,463.1 \text{ g/mol}$$

Weight % for SUS Triglyceride

$$= (10,463.1 / 85,782.3) * 100 = 12.2 \text{ wt\%}$$

Average Mole % of SSU Triglyceride

$$= (\text{Mol \% } S_2U \text{ triglyceride of 40:60 Pst/SBO blend}) * 2/3 = 37.1 * 2/3 = 24.7 \text{ mol \%}$$

Average Total Weight for SSU Triglyceride

$$= (\text{Avg. mol. wt. of } SU_2 \text{ triglyceride of 40:60 Pst/SBO blend}) * (\text{Mol \% of SSU triglyceride of 40:60 Pst/SBO blend}) = 843.8 \text{ g/mol} * 24.7 = 20,841.9 \text{ g/mol}$$

Weight % for SSU Triglyceride

$$= (20,841.9/85,782.3)*100 = 24.3 \text{ wt\%}$$

138. As noted above, the differences between Petrauskaite's experimentally determined mole% values and those calculated based on Random Distribution Hypothesis demonstrate that the distribution is not completely random, so Dr. Marangoni's calculation of the mole% of SUS and SSU from that of S₂U, and thus the calculation of the wt% of SUS and SSU, is not valid.

139. A POSITA would have recognized that using Petrauskaite's experimentally determined mole% values, which Petrauskaite demonstrates are not equivalent to the mole% values calculated by Random Distribution Hypothesis, in a calculation based on a randomization assumption results in an incorrect calculation. Thus, without an accurate calculation for the wt% of SUS and SSU, a POSITA would not have been able to determine the SUS/SSU ratio without knowing any measured values of SUS and SSU or knowing the degree of interesterification reaction. Thus, a POSITA would not have arrived at the claimed invention by relying on the teachings of Petrauskaite.

2. Dr. Marangoni's Reliance on Secondary References (Deffense Table IV and Neff) Is Faulty, Because Those References Are Inconsistent with the Compositions Taught in Petrauskaite

140. As noted above, Dr. Marangoni asserts that the wt% of fatty acids

he relies on for palm stearin and soybean oil are general knowledge in the art. EX1003, para [59]. For palm stearin, Dr. Marangoni relies on a composition made up of 68.8% palmitic acid, 5.1% stearic acid, 19.1% oleic acid, and 4.5% linoleic acid, citing Table IV in Deffense. EX1003, para [63]. For soybean oil, Dr. Marangoni relies on a composition made up of 10% palmitic acid, 4.2% stearic acid, 25.4% oleic acid, 53.4% linoleic acid, and 7% linolenic acid, citing Table 1 in Neff. EX1003, para [65].

141. As noted above, Dr. Marangoni's only basis for using the values from Deffense Table IV and Neff Table 1 is that they were known. However, there are significant inconsistencies between Petrauskaite, and Deffense and Neff that would have led a POSITA not to look to those references. For instance, the melting point in the palm stearin in Deffense is 55.9°C (*see* EX1014, 380 (Table IV)), while the palm stearin in Petrauskaite has a melting point of 56.5°C (*see* EX1007, 490 (Table 1)). Similarly, the ratio of PUFA/SFA of the palm stearin in Deffense is 0.06 ($4.5/(68.8+5.1)$) (*see* EX1014, 380 (Table IV)), while the palm stearin in Petrauskaite has a ratio of PUFA/SFA of 0.4 (*see* EX1007, 490 (Table 1)), and the ratio of PUFA/SFA of the soybean oil in Neff as selected by the Petitioner is 4.3 ($(53.4+7.0)/(10.0+4.2)$) (*see* EX1011, 1112), while the soybean oil in Petrauskaite has a ratio of PUFA/SFA of 5.5 (*see* EX1007, 490 (Table 1)).

142. Dr. Marangoni offers no reason or explanation why he relied on Deffense Table IV and Neff other than his assertion that they represent general knowledge in the art because they were known. As discussed above, the values cited by Dr. Marangoni from Deffense Table IV and Neff do not represent the general knowledge in the art because other values and ranges were known, a fact that Dr. Marangoni does not address, despite the fact that Deffense itself confirms this by showing a range of values for palm stearin in Tables I-IV. Dr. Marangoni offers no other reason why a POSITA would have looked to Deffense and Neff, and given the inconsistencies between those references and Petrauskaite, I believe that a POSITA would not have relied on them for the analysis, and certainly could not have stated that they represent the general knowledge in the art at the Critical Date.

X. CONCLUSION

143. For at least the reasons set forth above, I am of the opinion that the Challenged Claims would not have been obvious to a POSITA at the time of the invention of the '473 Patent.

144. I understand that this Declaration is to be filed in an IPR proceeding before the PTAB. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

145. I hereby declare under penalty of perjury that the foregoing is true and correct, that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and may jeopardize the validity of the application or any patent issuing thereon. If called to testify as to the truth of the matters stated herein, I could and would testify competently.

Dated: December 21, 2024



Dr. Eric A. Decker