

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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JIANGSU FAVORED NANOTECHNOLOGY CO., LTD.,

Petitioner,

v.

P2I LTD.,

Patent Owner.

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CASE: IPR2024-00380  
Patent No. 11,041,087

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**PETITION FOR *INTER PARTES* REVIEW  
OF U.S. PATENT NO. 11,041,087**

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Mail Stop PATENT BOARD  
Patent Trial and Appeal Board  
P.O. Box 1450  
Alexandria, VA 22313-1450

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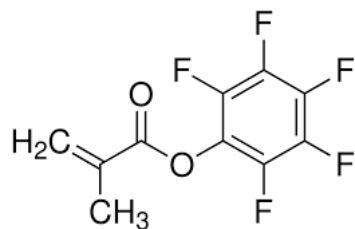
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**TABLE OF ABBREVIATIONS AND CONVENTIONS**

|                       |                                                                                                                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AIA                   | America Invents Act                                                                                                                                                                                     |
| BDVE                  | 1,4-butanediol divinyl ether                                                                                                                                                                            |
|                       | $\text{H}_2\text{C}=\text{CH}-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-\text{O}-\text{CH}=\text{CH}_2$                                                                                     |
| Board                 | Patent Trial and Appeal Board                                                                                                                                                                           |
| Cohen                 | U.S. Patent 2,716,638, “Divinyltetramethyldisiloxane and polymers therefrom,” to M. Cohen and J.R. Ladd (Ex. 1004)                                                                                      |
| DVTMDS                | divinyl tetramethyldisiloxane                                                                                                                                                                           |
|                       | $\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\   \quad   \\ \text{CH}_2=\text{CH}-\text{Si}-\text{O}-\text{Si}-\text{CH}=\text{CH}_2 \\   \quad   \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$     |
| Favored or Petitioner | petitioner Jiangsu Favored Nanotechnology Co., Ltd.                                                                                                                                                     |
| Francesch             | Francesch, L. et al, “Fabrication of Bioactive Surfaces by Plasma Polymerization Techniques Using a Novel Acrylate-Derived Monomer,” <i>Plasma Processes and Polymers</i> , 2:605–611 (2005) (Ex. 1006) |
| IPR                   | <i>inter partes</i> review                                                                                                                                                                              |
| Legein                | International Publication WO 2014/026967, “Surface Coatings,” to Filip Legein, et al. (Ex. 1005)                                                                                                        |
| POSA                  | person of ordinary skill in the art                                                                                                                                                                     |
| P2i                   | patent owner P2i Ltd.                                                                                                                                                                                   |

PFM

pentafluorophenyl methacrylate



WCA

static water contact angle

'087 patent

U.S. Patent 11,041,087 (Ex. 1001)

xx:yy-zz

column xx, lines yy to zz

**EXHIBIT LIST**

- |          |                                                                                                                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ex. 1001 | U.S. Patent 11,041,087, “Coatings,” to S.R. Coulson, et al. (“the ’087 patent”) <sup>1</sup>                                                                                                              |
| Ex. 1002 | Declaration of Dr. Karen Gleason                                                                                                                                                                          |
| Ex. 1003 | Curriculum vitae for Dr. Karen Gleason                                                                                                                                                                    |
| Ex. 1004 | U.S. Patent 2,716,638, “Divinyldimethylsiloxane and Polymers Therefrom,” to M. Cohen and J.R. Ladd (“Cohen”)                                                                                              |
| Ex. 1005 | International Publication WO 2014/026967, “Surface Coatings,” to F. Legein, et al. (“Legein”)                                                                                                             |
| Ex. 1006 | Francesch, L. et al, “Fabrication of Bioactive Surfaces by Plasma Polymerization Techniques Using a Novel Acrylate-Derived Monomer,” <i>Plasma Processes and Polymers</i> , 2:605–11 (2005) (“Francesch”) |
| Ex. 1007 | Declaration of Dr. Salvador Borrós Gómez                                                                                                                                                                  |
| Ex. 1008 | U.S. Patent Application Publication No. 2012/0037400, “Electrically Isolating Polymer Composition,” to L.L. Fields, et al.                                                                                |

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<sup>1</sup> Citation convention: Where an exhibit contains original page numbering that uniquely identifies each page in the exhibit, this petition uses those page numbers to refer to the pages in the exhibit. Where an exhibit contains original page numbering that does not clearly and uniquely identify each page in the exhibit (such as in the ’087 patent’s file history, Ex. 1028), or does not contain page numbering at all, unique page numbering added in the lower right corner of the exhibit will be used.

- Ex. 1009 Makino, K., et al., “Low loss graded index polymer optical fiber with high stability under damp heat conditions,” *Optics Express* 20(12):12893-98 (2012)
- Ex. 1010 International Publication WO 99/64662, “Surface Coatings” to J.P.S. Badyal, et al.
- Ex. 1011 U.S. Patent 5,804,669, “Preparation of Polymers Comprising Peroxycarboxyl Groups,” to Jürgen Tropsch and Jörg Breitenbach
- Ex. 1012 International Publication WO 2012/158953, “Coated Electronic Devices and Associated Methods,” to Filip Legein, et al.
- Ex. 1013 U.S. Patent Application Publication US 2013/0176700, “Electronic Devices with Internal Moisture Resistant Coatings,” to B. Stevens, et al.
- Ex. 1014 U.S. Patent Application Publication US 2007/0020451, “Moisture Barrier Coatings,” to R. Padiyath and M.M. David
- Ex. 1015 U.S. Patent Application Publication US 2005/0141738, “Hydrophobic Coating of Individual Components of Hearing Aid Devices,” to E. Karamuk
- Ex. 1016 U.S. Patent 6,551,950, “Surface Coatings,” to J.P.S. Badyal, et al.
- Ex. 1017 U.S. Patent 4,562,091, “Use of Plasma Polymerized Organosilicon Films in Fabrication of Lift-Off Masks,” to H.S. Sachdev and K.G. Sachdev
- Ex. 1018 U.S. Patent 7,439,315, “Polymer Film and Method for Producing the Same,” to N. Kunimi, et al.
- Ex. 1019 Coulson, S.R., et al., “Ultralow Surface Energy Plasma Polymer Films,” *Chemistry of Materials* 12(7):2031–2038 (2000)
- Ex. 1020 U.S. Patent Application Publication US 2005/0034667, “Method and apparatus for forming silicon-containing insulation film having low dielectric constant,” to N. Tsuji, et al.

- Ex. 1021 U.S. Patent Application Publication US 2010/0203347, “Method for Liquid Proofing an Item by Plasma Graft Polymerisation,” to S. Coulson
- Ex. 1022 International Publication WO 98/58117, “Surface Coatings,” to J.P.S. Badyal, et al.
- Ex. 1023 Tarducci, C., et al., “Synthesis of Cross-Linked Ethylene Glycol Dimethacrylate and Cyclic Methacrylic Anhydride Polymer Structures by Pulsed Plasma Deposition,” *Macromolecules* 35(23):8724–8727 (2002)
- Ex. 1024 U.S. Patent 6,214,423, “Method of Forming a Polymer on a Surface,” to W.W. Lee, et al.
- Ex. 1025 International Publication WO 2012/168440, “A Coated Substrate Having Hydrophobic Moiety-Repelling Surface Characteristics and Process for Preparing the Same,” to C. Taesler
- Ex. 1026 Yagüe, J.L. and Gleason, K.K., “Enhanced Cross-Linked Density by Annealing on Fluorinated Polymers Synthesized via Initiated Chemical Vapor Deposition to Prevent Surface Reconstruction,” *Macromolecules* 46(16):6548-6554 (2013)
- Ex. 1027 U.S. Patent 6,207,238, “Plasma Enhanced Chemical Deposition for High and/or Low Index of Refraction Polymers,” to J.D. Affinito
- Ex. 1028 Prosecution history of the '087 patent (excerpted)
- Ex. 1029 Yao, W., et al., “Fluorinated poly(meth)acrylate: Synthesis and properties,” *Polymer* 55(24):6197-6211 (2014)
- Ex. 1030 Toyama, M., et al., “Surface Wettability of Alkyl Methacrylate Polymers and Copolymers,” *Journal of Colloid and Interface Science* 47(3) 802-803 (1974)
- Ex. 1031 Syromyatnikov, L., et al., “Aryl (meth)acrylates and polymers based on them,” *Russian Chemical Reviews* 68(9) 781-99 (1999)

- Ex. 1032 Gargallo, L. et al., “Polymer conformation and viscometric behavior,” *Polymer Bulletin* 10, 264-70 (1983)
- Ex. 1033 Ham, G. et al., “Cross-linking in the polymerization of vinyl benzoate and related compounds,” *Journal of Polymer Science* 8(1):91-99 (1952)
- Ex. 1034 Asandulesa, M., et al., “Chemically polymerization mechanism of aromatic compounds under atmospheric pressure plasma conditions,” *Plasma Processes and Polymers* 10, 469-80 (2013)
- Ex. 1035 Chen, Y-J., et al., “The influence of alkylene spacers on conformational and thermal properties of poly(aryl methacrylates),” *Journal of Polymer Science: Part B Polymer Physics* 32,715-19 (1994)
- Ex. 1036 Odian, G., *Principles of Polymerization*, John Wiley & Sons, 4th ed. (2004) (excerpted)
- Ex. 1037 Kurosawa, S., et al., “Detection of deposition rate of plasma polymerized acrylate and methacrylate derivatives using quartz crystal microbalance,” *Thin Solid Films* 457:26-33 (2004)
- Ex. 1038 Teng, H. et al., “Property modification of poly(methyl methacrylate) through copolymerization with fluorinated aryl methacrylate monomers,” *Polym. Adv. Techno.* 18:453-457 (2007)
- Ex. 1039 Rau, C., and Kulisch, W., “Mechanisms of Plasma Polymerization of Various Silico-organic Monomers,” *Thin Solid Films* 249: 28-37 (1994) (“Rau”)
- Ex. 1040 Yasuda, H., *Plasma Polymerization*, Academic Press, London (1985) (excerpted)
- Ex. 1041 Kurosawa S. et al., “Detection of the Deposition Rate of Plasma-Polymerized Films with a Quartz Crystal Microbalance,” *Journal of Photopolymer Science and Technology*, 13:33-38 (2000)

- Ex. 1042 Clayden, J., et al., *Organic Chemistry*, Oxford University Press, New York (2012) (excerpted)
- Ex. 1043 Kabza, K., et al., “Contact angle goniometry as a tool for surface tension measurements of solids, using Zisman plot method,” *Journal of Chemical Education* 77(1):63-65 (2000)
- Ex. 1044 U.S. Patent 7,097,705, “Cationic-anionic blends for dynamic surface tension reduction,” to C.D. Smith, et al.
- Ex. 1045 Talib et al., “Plasma Polymerization of Silicon-Containing Monomers,” *Journal of Photopolymer Science and Technology*, 14(1):129-138 (2001)
- Ex. 1046 Kurosawa, S., et al., “Detection of deposition rate of plasma-polymerized silicon-containing films by quartz crystal microbalance,” *Thin Solid Films* 407:1-6 (2002)
- Ex. 1047 Liu, J. and Avendaño, S.M., “Microbial degradation of polyfluoroalkyl chemicals in the environment: A review,” *Environment International* 61:98-114 (2013)
- Ex. 1048 U.S. Patent 3,816,564, “Insulation Coating Compositions,” to H.R. Holliday and G.L. Schurter
- Ex. 1049 U.S. Patent 8,389,070, “Coating of a polymer layer using low power pulsed plasma in a plasma chamber of large volume,” to S.R. Coulson et al.
- Ex. 1050 1,4-butanediol divinyl ether (BDVE) (CAS No. 3891-33-6) from chemspider.com
- Ex. 1051 pentafluorophenyl methacrylate (PFM) (CAS No. 13642-97-2) from chemspider.com
- Ex. 1052 Joback, K.G. and Reid, R.C., “Estimation of pure-component properties from group-contributions,” *Chemical Engineering Communications* 57:233-243 (1987)

- Ex. 1053      International Publication WO 2013/019492, “Self-stick foam adhesive,” to S. Traser and J.D. Forster
- Ex. 1054      U.S. Patent Application Publication No. 2010/0224568, “Use of silica for the removal of organosilanes,” to S. Selcuk
- Ex. 1055      U.S. Patent Application Publication No. 2010/0152377, “Process for preparing polyester composite materials,” to J. Chen et al.
- Ex. 1056      International Publication WO 2012/109228, “Low-tack, hydrophobic ophthalmic device materials,” to W. Laredo and X. Jiang
- Ex. 1057      Muir, D.C.G. and Howard, P.H., “Are there other persistent organic pollutants? A challenge for environmental chemists,” *Environmental Science & Technology* 40(23):7157-66 (2006)
- Ex. 1058      U.S. Patent 8,222,348, “Epoxy silicone and process for producing same, and curable mix composition using same and use thereof,” to Y. Kuroda, et al.

## I. Introduction

Petitioner Jiangsu Favored Nanotechnology Co., Ltd. (“Favored” or “Petitioner”) requests IPR and cancelation of claims 1-5, 7, and 9-14 of U.S. Patent 11,041,087 (the ’087 patent) (Ex. 1001).

5 Patent owner P2i first applied for the ’087 patent as a continuation of U.S. Patent Application No. 15/735,130, which issued as U.S. Patent 10,421,876 (’876 patent). P2i statutorily disclaimed the ’876 patent’s claims soon after the Board instituted review on obviousness grounds in IPR2020-01198. *Favored Tech Corp. v. P2i Ltd.*, IPR2020-01198, Paper 15 (PTAB July 7, 2021).

10 P2i’s follow-on ’087 patent shares much in common with its now-disclaimed parent. Both claimed using plasma polymerization—a well-known and widely applicable technique—to apply protective, water-resistant coatings to electronics. And both claimed polymer coatings made using prior-art monomer and crosslinker reagents. For the monomer, the ’087 claims recite known acrylate compounds contain-  
15 ing a terminal aryl group. For the crosslinker, P2i initially tried to claim *any* crosslinking reagent with two or more unsaturated bonds, but it obtained allowance by limiting the ’087 claims to a hodgepodge of more specific crosslinker structures that the examiner failed to recognize in the prior art. But those crosslinkers were known too, and the prior art described copolymerizing them with aryl acrylate monomers.

In short, the '087 patent suffers from the same fundamental problem as its disclaimed predecessor: its claims recite no more than familiar elements combined according to conventional methods with predictable results. Favored asks that the Board institute IPR and hold those claims unpatentable for obviousness under 35 U.S.C. § 103.

## **II. Overview regarding protective polymer coatings for electronic devices**

The '087 patent's sole independent claim recites electronic devices or components bearing a "protective cross-linked polymeric coating on a surface of the device or component," where the coating has been applied by exposing the substrate to a plasma. Ex. 1001, 18:25-35. The plasma must contain two compounds that react to form the resulting polymer coating: a monomer containing a carbon-carbon double bond and an aryl group, and a cross-linking reagent fitting any one of several generic structural formulas. *Id.* 18:25-20:11.

Those features were well known by the '087 patent's asserted priority date in June 2015. Portable electronics were everywhere, and the recognized risk of damage from spills and environmental exposure provided ample motivation to apply water-repellent coatings to protect such devices. Plasma polymerization was an established technique known to be well-suited for applying such coatings to electronics. And the monomers and crosslinkers of the '087 claims were not just known; the prior art had already described using them together to make crosslinked copolymer compositions.

**A. State of the art by June 2015 – Polymer coatings prepared using an aryl monomer and a crosslinker were well known**

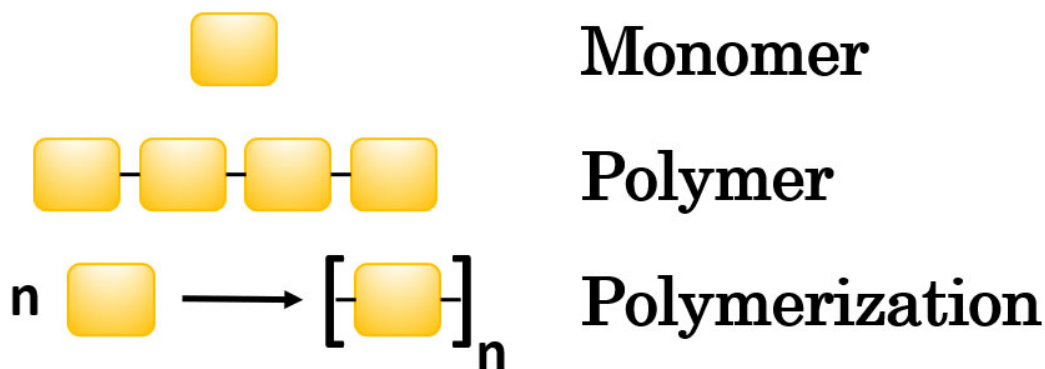
**1. Ubiquitous portable electronics were being coated to protect against environmental contaminants**

5 By June 2015, portable electronics like mobile phones and laptops were common. It was well known that such devices could be damaged during everyday use by exposure to gases like water vapor and oxygen and by contact with liquids due to rain, spills, or accidental submersion. *E.g.*, Ex. 1005, 1:1-17, 29:11-37:10; Ex. 1011, 1:9-34; Ex. 1012, 1:9-2:12; Ex. 1013 ¶¶1-2; Ex. 1014 ¶2; Ex. 1002 ¶61.

10 Accordingly, skilled artisans had applied various polymer-based coatings to electronic devices to insulate them from such hazards. Ex. 1011 Abstract; Ex. 1014 ¶¶5, 21-24; Ex. 1012, 2:8-3:14, 7:3-21; Ex. 1013 ¶¶2-6, 44-46; Ex. 1005, 4:14-6:11; Ex. 1015 ¶¶11, 30-34. Prior-art polymers served known functions like repelling water (Ex. 1012, 11:4-11; Ex. 1013 ¶¶3-4, 41-46; Ex. 1005, 11:17-12:25; Ex. 1015 ¶11),  
15 creating a barrier against passage of water or other molecules between the device and the environment (Ex. 1014 ¶24; Ex. 1012 7:3-10; Ex. 1008 ¶43; Ex. 1013 ¶¶39-40; Ex. 1005 16:7-9), and providing electrical insulation (Ex. 1008 ¶43; Ex. 1012 7:3-10; Ex. 1005 5:13). *See also* Ex. 1002 ¶¶58-61.

**2. Compounds with unsaturated carbon-carbon bonds were known to polymerize upon exposure to free-radical species from various sources**

Polymers are large molecules made by bonding subunits known as monomers together into extensive repeating chains or networks through a process known as polymerization. A simple schematic is provided below:



Ex. 1002 ¶32.

Chain polymerization was an important and well-characterized mechanism for forming polymers well before 2015. To carry out a chain polymerization reaction, skilled artisans knew to use at least one monomer containing an unsaturated carbon-carbon bond, such as a double bond (C=C) or a triple bond (C≡C). Ex. 1002 ¶33; Ex. 1036 at 198. In addition to an unsaturated monomer, chain polymerization was also known to involve an initiator species. One commonly used approach used initiators that produce a free radical. Ex. 1002 ¶33. Free radicals readily reacted with an unsaturated bond in a monomer, creating a new free-radical reactive center in the monomer. The resulting free-radical reaction product would repeat the same reaction

with another monomer molecule, with the cycle continuing over and over to add monomer units one at a time and thus create a growing polymer chain. Ex. 1002 ¶33; Ex. 1036 at 205. Many types of unsaturated monomers were known to be well-suited for free-radical chain polymerization, including acrylates, methacrylates, and vinyl esters. See Ex. 1036 at 200, Table 3-1; Ex. 1002 ¶¶33-35.

Chain polymerization of unsaturated monomers was also known to occur under plasma conditions through a similar mechanism initiated by free radicals present in plasma. Ex. 1036 at 227; Ex. 1037 at 31; Ex. 1002 ¶¶35, 56. Accordingly, skilled artisans had observed that monomers compatible with conventional free-radical polymerization were also useful for plasma polymerization and resulted in high deposition rates for plasma-deposited polymer films. Ex. 1037 at 32; Ex. 1002 ¶¶35-36, 43, 46, 56-57.

### **3. Plasma polymerization was routine and had been used to apply protective coatings to electronics**

Plasma polymerization had become a common method for applying polymer coatings by 2015. Ex. 1005, 6:10-11; Ex. 1006 at 606-07; Ex. 1011, 2:33-4:3; Ex. 1012, 7:22-8:7; Ex. 1014 ¶11; 1013 ¶¶45-46; Ex. 1015 ¶29; Ex. 1002 ¶¶35-44.

Plasma polymerization referred to forming polymeric materials under plasma conditions. Ex. 1002 ¶35; Ex. 1011, 2:33-3:12; Ex. 1012, 3:5-14. Typically, plasma polymerization involved vaporizing a monomer and passing the resulting gas through an enclosed plasma chamber, where an electrical field was applied to induce

a plasma state in the monomer gas. Ex. 1005, 21:20-25; Ex. 1011, 3:20-4:3, 7:6-17; Ex. 1012, 11:17-13:20; Ex. 1002 ¶¶36-39, 41. The term *plasma* described gas in an ionized state, which POSAs sometimes referred to as a “glow discharge” because plasmas often give off visible light. Ex. 1002 ¶38; Ex. 1011, 7:14-17; Ex. 1017, 3:26-33. When a substrate is present, reactive species in the monomer plasma impinge on the substrate where they form a plasma-polymer film on its surface. Ex. 1010, 2:14-24; Ex. 1012, 13:5-20; Ex. 1005, 21:20-22:2; Ex. 1018 8:17-48; Ex. 1002 ¶¶40, 44.

Plasma polymerization was widely used by 2015. Ex. 1002 ¶¶36, 58-61. At least fifteen years earlier, one of the '087 patent's inventors had observed that plasma polymerization was already “quite widely used for the deposition of polymeric coatings onto a range of surfaces” and that equipment for applying plasma coatings was “conventional” and “known in the art.” Ex. 1010, 2:10-12, 11:26-27; *see also* Ex. 1011, 6:25-7:12; Ex. 1010, 10:8-12, 11:26-27; Ex. 1012, 8:22-10:12; Ex. 1016, 1:40-50; Ex. 1017, 3:26-40; Ex. 1027, 1:20-41. The '087 patent itself confirms that conditions for applying plasma-polymer coatings could be determined “using routine methods.” Ex. 1001, 15:4-5.

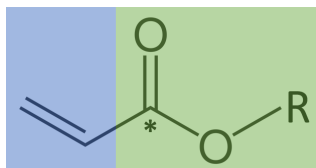
Plasma polymerization was also recognized as a particularly advantageous technique for applying coatings to electronic devices. Ex. 1002 ¶¶58, 61. Using gas-phase plasma deposition allowed skilled artisans to apply polymer coatings to external *and internal* surfaces of a device. Ex. 1012, 8:1-4, 15:15-20, 16:20-24. Plasma

polymerization was also recognized as a dry technique that could create polymer coatings in situ without exposing the underlying electronics to any potentially damaging liquids, unlike solution-based prior-art polymerization techniques. Ex. 1010, 2:10-14; Ex. 1012:15:15-20; Ex. 1002 ¶¶44. Plasma polymerization also readily provided even, conformal coatings across curved or irregular surfaces and provided improved substrate adhesion. Ex. 1005 at 4:1-13; Ex. 1012, 8:15-21; Ex. 1002 ¶¶44.

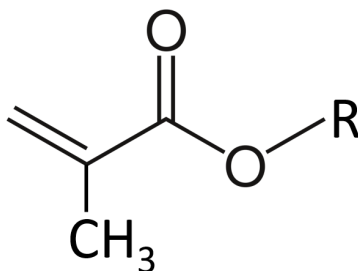
**4. Acrylate monomers, including those containing aryl groups, had long been used to make polymer coatings**

Polymers created via plasma polymerization (and through other conventional free-radical activation techniques) generally comprise repeating monomers linked together to form larger chains or networks. Ex. 1002 ¶¶32-33, 43. As noted, monomers for polymer production typically included at least one reactive unsaturated bond, such as a double bond, capable of facilitating free-radical polymerization. Ex. 1002 ¶¶32-33, 45.

Acrylates were among the most well-known and widely used monomers for polymer production. Ex. 1002 ¶¶46-47. Acrylates used for polymerization were esters, as illustrated below:

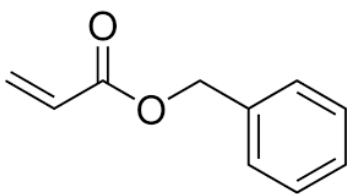


Ex. 1002 ¶46. Acrylates characteristically contained an unsaturated vinyl group (blue) directly linked to the carbonyl carbon (starred) of an ester group (green). *Id.* Methacrylates, a common type of acrylate, included an additional methyl (–CH<sub>3</sub>) substituent at the vinyl group:

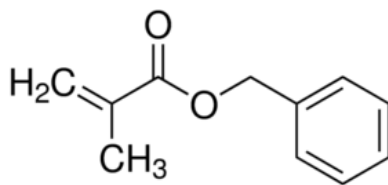


Ex. 1002 ¶46.

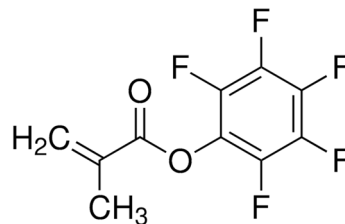
Acrylate monomers were recognized as both bifunctional and versatile: the vinyl group's double bond facilitated polymerization, and the ester group could be used to introduce a wide range of functional substituents at the variable R position and thus confer desired properties on the resulting polymer. Ex. 1002 ¶¶45-47. By 2015, many different acrylate and methacrylate monomers had been used to prepare polymers for a variety of applications. Ex. 1002 ¶47; Ex. 1006 at 605-07, Ex. 1005, 4:15-5:5; Ex. 1031 at 781; Ex. 1008 ¶¶23-24; Ex. 1022, 7:21-8:12; Ex. 1029 Abstract. That included acrylic monomers containing R groups with a terminal aryl ring, such as benzyl acrylate, benzyl methacrylate, and pentafluorophenyl methacrylate (PFM).



*Benzyl  
Acrylate*



*Benzyl  
Methacrylate*



*Pentafluorophenyl  
Methacrylate (PFM)*

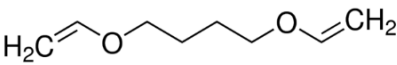
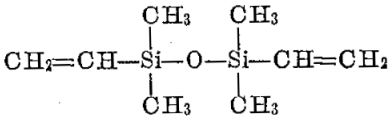
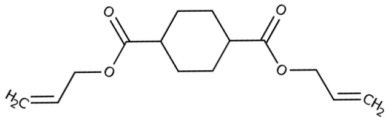
Ex. 1002 ¶¶79, 84, 155.

## 5. Crosslinkers were commonplace in polymer production

In addition to monomers like benzyl acrylate, benzyl methacrylate, and PFM, POSAs regularly incorporated crosslinker molecules into prior-art polymerization reactions. In general, crosslinkers have at least two reactive unsaturated bonds with an intervening linker moiety. Ex. 1002 ¶¶51-52. The bifunctional structure of a crosslinker—with *multiple* unsaturated bonds, each one capable of mediating a new intermolecular bond during chain polymerization—allows crosslinkers to connect separate polymer chains together during polymerization, resulting in robust polymers with interconnected mesh-like structures rather than separate, disconnected polymer chains. Ex. 1002 ¶¶50-54.

Numerous crosslinking reagents containing at least two unsaturated bonds had been used with acrylate-based monomers to produce crosslinked copolymer coatings. Ex. 1002 ¶55; *e.g.*, Ex. 1004, 1:15-30, 3:50-65; Ex. 1048, 3:20-60; Ex. 1014 ¶¶11, 52-54; Ex. 1006 at 607; Ex. 1025 ¶¶11, 20. Crosslinkers were often grouped into

families characterized by structural features present between the unsaturated reactive sites. Familiar categories included divinyl ether, divinyl, and diallyl crosslinkers. Examples are shown below, all of which contain the typical structure having at least two unsaturated carbon-carbon bonds separated by an intervening linker region.

| <b><i>Divinyl ether</i></b> |                                                                                                                                     |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| configuration               | $\text{CH}_2=\text{CH}-\text{O}-\text{Z}-\text{O}-\text{CH}=\text{CH}_2$                                                            |
| example                     | <br>1,4-butanediol divinyl ether (BDVE)           |
| <b><i>Divinyl</i></b>       |                                                                                                                                     |
| configuration               | $\text{CH}_2=\text{CH}-\text{X}-\text{Z}-\text{X}-\text{CH}=\text{CH}_2$<br><i>**X is not O, O-(C=O), or CH<sub>2</sub></i>         |
| example                     | <br>divinyl tetramethyldisiloxane (DVTMDS)       |
| <b><i>Diallyl</i></b>       |                                                                                                                                     |
| configuration               | $\text{CH}_2=\text{CH}-\text{CH}_2-\text{Z}-\text{CH}_2-\text{CH}=\text{CH}_2$                                                      |
| example                     | <br>diallyl 1,4-cyclohexanedicarboxylate (DCHD) |

5 Ex. 1002 ¶¶51-52.

Crosslinking was known to impart “good chemical and mechanical stability characteristics” on the resulting polymer. Ex. 1023 at 8724. POSAs also knew that crosslinking led to improved barrier properties against passage of liquids or gases

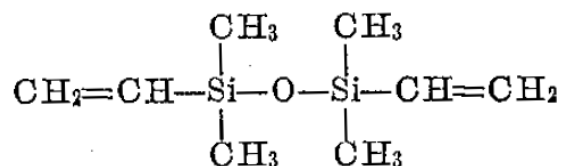
and resulted in greater solvent and chemical resistance. Ex. 1002 ¶¶50-51, 53; Ex. 1004 3:50-65; Ex. 1014 ¶¶2, 11, 25, 52; Ex. 1025 ¶¶20-21, 34, 36; Ex. 1006 at 610. For example, the prior art taught that water-repellent coatings could be improved by copolymerizing acrylate-based monomers with a crosslinking reagent. Ex. 1010 4:1-9. The resulting crosslinked copolymer coatings demonstrated improved durability while retaining protective properties obtained using the monomer alone. Ex. 1010 4:1-9, 4:17-5:5.

## **B. Overview of primary prior-art references**

### **1. Cohen described crosslinked polymers made by free-radical chain polymerization using a benzyl acrylate or benzyl methacrylate monomer with DVTMDS**

Cohen (Ex. 1004) issued as U.S. Patent 2,716,638 on August 30, 1955. Cohen is prior art under § 102(a)(1).

Cohen described copolymers used to insulate various electrical devices and components. Ex. 1004, 5:1-25; Ex. 1002 ¶79. The copolymers were prepared from two components. First, Cohen described using an organosilane crosslinker known as divinyl tetramethyldisiloxane (DVTMDS), which has the structure:



Ex. 1004, 1:15-34; Ex. 1002 ¶78. Second, Cohen taught that DVTMDS could be combined with any of several specified monomers, Ex. 1004 at 2:14-30, 4:38-57,

including benzyl acrylate and benzyl methacrylate, *id.* at 4:38-39; Ex. 1002 ¶79. Cohen explained that copolymers prepared using DVTMDS and a disclosed monomer could be made using any known polymerization method, including free-radical initiation. Ex. 1004 at 1:31-60; Ex. 1002 ¶¶80-81.

5                   **2.     Legein described applying protective polymer coatings to electronics using plasma polymerization**

Legein (Ex. 1005) published as International Publication WO2014/026967 on February 20, 2014. Legein is prior art under § 102(a)(1).

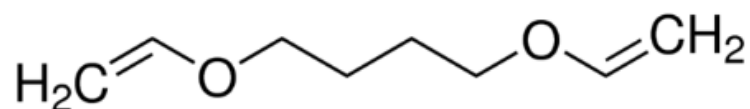
Legein described protecting electrical components from corrosion and water  
10 damage by “coating the component by plasma deposition of a polymer coating.” Ex. 1005 Abstract, *see e.g.*, 1:1-17, 4:5-13, 6:10-11, 10:22-11:2, 12:14-25. The plasma coatings were prepared using “any one or more” of an acrylate, methacrylate, or organosilane. Ex. 1005, 4:25-5:2, 10:17-20, 16:7-14; Ex. 1002 ¶82. Plasma polymerization was shown to produce uniform, well-adhered polymer coatings with excel-  
15 lent liquid-repellency that covered all surfaces of the device. Ex. 1005, 4:1-13, 6:10-16, 16:7-9, 21:24-22:1, 37:12-22.

**3.     Francesch described plasma-polymer coatings combining pentafluorophenyl methacrylate with BDVE**

Francesch (Ex. 1006) is a scientific article entitled “Fabrication of Bioactive  
20 Surfaces by Plasma Polymerization Techniques Using a Novel Acrylate-Derived Monomer,” published in the journal *Plasma Processes and Polymers*. Francesch

bears a year-2005 copyright notice as a publication of Wiley-VCH Verlag GmbH & Co., as well an abbreviated citation bearing the year 2005 (“*Plasma Process. Polym.* 2005, 2, 605–611”). Ex. 1006 at 605. A POSA would have recognized Wiley as an established publisher of scientific articles and would have been familiar with *Plasma Processes and Polymers* as a well-known scientific journal. Ex. 1002 ¶83. The reference’s printed copyright and citation dates demonstrate that Francesch became publicly available as a printed publication during the year 2005. Ex. 1002 ¶83; see *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 19-20 (PTAB Dec. 20, 2019) (precedential). In addition, the accompanying declaration provided by an author of the article demonstrates that Francesch was made publicly available in September 2005. Ex. 1007. Francesch is a prior-art printed publication under § 102(a)(1).

Francesch described preparing crosslinked polymer coatings by plasma polymerization using pentafluorophenyl methacrylate (PFM) monomer and a cross-linker known as 1,4-butanediol divinyl ether (BDVE). Francesch at 606; Ex. 1002 ¶84-85. The structure of BDVE is shown below.



Ex. 1002 ¶85. Francesch described applying those crosslinked PFM/BDVE copolymer coatings to silicon-wafer substrates. Francesch at 607.

**4. The cited references were before the examiner but not discussed or cited in any rejection**

As discussed below in Section III.C., Cohen, Legein, and Francesch were before the Patent Office during prosecution of the '087 patent but were not discussed by the examiner or cited in any rejection.

**III. Overview of the '087 patent**

**A. The earliest priority date is June 9, 2015**

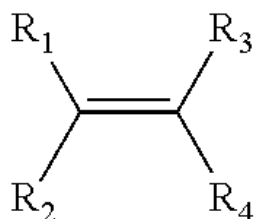
The '087 patent claims priority from European Application No. 15386017, filed on June 9, 2015. For purposes of this proceeding, Petitioner assumes but does not concede that priority date. The AIA versions of 35 U.S.C. §§ 102 and 103 apply.

**B. The '087 patent claims electronic devices with a plasma-polymer coating prepared from an aryl acrylate monomer and a crosslinker from any of several different groups**

The '087 patent “relates to protective coatings for electronic or electrical devices and components thereof, and methods for forming such coatings.” Ex. 1001, 1:15-17. The coated devices include “a wide variety of substrates” like smartphones, microphones, or circuit boards. Ex. 1001, 14:37-63. Conditions for conducting plasma polymerization to apply the polymer coatings are described as flexible and “can be determined using routine methods.” Ex. 1001, 14:66-15:5.

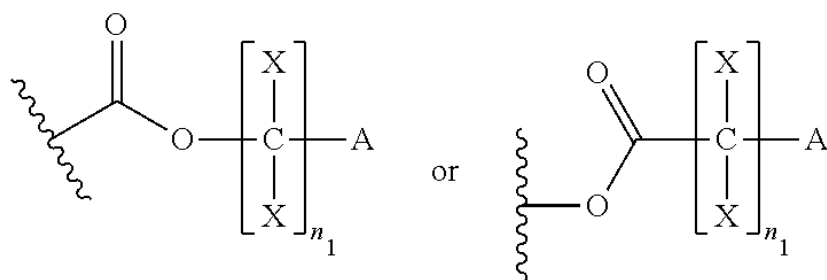
Most of the specification focuses on the structures of various monomers and crosslinkers that can be used to make the polymer coatings. Ex. 1001 4:37-13:8.

**Monomers.** The claims require coated electronics prepared by polymerizing a monomer with a crosslinker under plasma conditions. And like the specification, the claims focus primarily on the structures of the monomer and crosslinker. Claim 1, the sole independent claim, requires a monomer with the following generic structure containing a carbon-carbon double bond:



Ex. 1001, 18:35-44. Claim 1 further defines each of the illustrated  $R_1 - R_4$  variable positions. For the  $R_1$ ,  $R_2$ , and  $R_4$  groups, each can be one of a handful of relatively simple substituents, including hydrogen and short hydrocarbon or halocarbon chains.

Ex. 1001, 18:45-48. For  $R_3$ , the claims require one of two choices, as shown in the excerpted structural diagrams from claim 1 below:



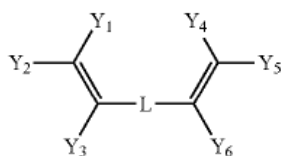
Ex. 1001, 18:48-57. The option at left shows a generic acrylate structure, and on the right is a generic vinyl ester. Ex. 1002 ¶64. Both  $R_3$  structures in claim 1 permit, but do not require, a variable-length  $CX_2$  chain because the length of that chain (illustrated as “ $n_1$ ”) can be zero. Ex. 1001 18:58-62. Each  $R_3$  structure must contain a

terminal aryl group, denoted by the letter “A.” Ex. 1001, 18:61-62; Ex. 1002 ¶65.

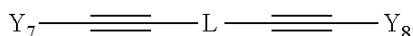
The specification provides very limited reference to aryl groups, stating only that variable positions in the disclosed monomers may contain “aryl optionally substituted by halo.” Ex. 1001 2:52, 9:49, 10:26, 13:12. The '087 patent contains no work-

5 ing example of an aryl monomer and no description of any specific aryl group. Ex. 1002 ¶65.

**Crosslinkers.** The '087 claims also require using a crosslinker with two unsaturated bonds. Ex. 1001, 18:32-33, 18:63-20:11, 4:38-40. Claim 1 specifies two alternative, generic crosslinker structures:



Compound (i)



Compound (ii)

Ex. 1001 19:1-10. Compound (i) shows a generic alkene crosslinker with two double bonds, and compound (ii) shows a generic alkyne crosslinker with two triple bonds.

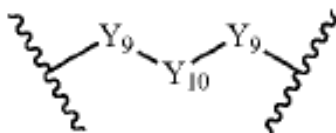
Ex. 1002 ¶66; *see* Ex. 1001 4:38-41. Both structures further contain a generic “linker moiety” bridging their reactive unsaturated bonds, represented by the letter “L”  
15 above. Ex. 1001 19:14; Ex. 1002 ¶66.

While having two unsaturated bonds is a “basic requirement” for the crosslinker, the linker moiety “is not especially limited” and need only “join[ ] together the two unsaturated bonds.” Ex. 1001 4:38-43. Claim 1 recites three possible forms

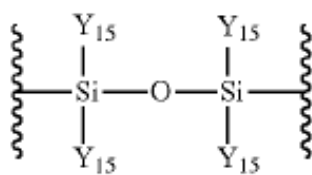
for the structure of linker moiety (L). The first two options are grouped together as alternatives under “formula A”:



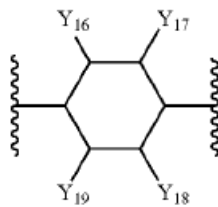
Ex. 1001, 19:15-29; Ex. 1002 ¶ 67. In the two “formula A” linkers, the variable  $Y_{10}$  position can be “selected from optionally substituted cyclic, branched or straight chain  $C_1$ - $C_8$  alkylene and a siloxane group.” Ex. 1001, 19:27-29. A third option for the linker moiety of the claimed crosslinkers is presented as “formula B”:



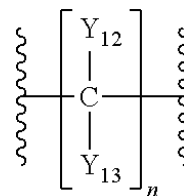
Ex. 1001, 19:30-38. Formula B includes numerous configurations for each of the  $Y_9$  positions, Ex. 1001 19:38-42, and three generic structures for the central  $Y_{10}$  position, Ex. 1001, 19:42-20:11. The three options for the central  $Y_{10}$  position of the formula B linker moiety are as follows, for convenience identified here as formulas B1-B3:



*Formula B1*



*Formula B2*



*Formula B3*

Ex. 1001 19:43-20:11; Ex. 1002 ¶68. Altogether, claim 1 encompasses a wide variety of crosslinkers, with a range of formula A and formula B configurations that can

each be included as the linker moiety. Dependent claims 4-8 add further structural limitations within one or more of the claimed classes of generic linker moieties. Ex. 1001, 20:20-56. Several specific crosslinking reagents are recited in dependent claim 7. Ex. 1001, 20:46-53.

5           Other dependent claims recite that the coating provides liquid repellency or a physical barrier (claims 2 and 3), recite subgenres of aryl monomers (claims 9 and 10), or specify certain kinds of electrical devices or components for the coated substrate (claims 11-14). Ex. 1001, 20:12-21:13.

10           **C.     P2i obtained the '087 patent by limiting the claims to particular groups of crosslinkers**

          The original claims presented during prosecution of the '087 patent recited electronic devices coated with a plasma-polymer coating prepared using a monomer and a crosslinker. Ex. 1028 at 65 (original claim 1). Those claims required the same monomer structures as the '087 patent's issued claims. *Compare* Ex. 1028 at 65-69 (original claims 1, 18, 19), *with* Ex. 1001, 18:26-20:60 (claims 1, 9, 10). But original claim 1 broadly encompassed *any* crosslinking reagent, with no limits on the crosslinking reagent's structure. Ex. 1028 at 65 (original claim 1). Original dependent claims 4-17 added various structural limitations for the crosslinking reagent, including generic structures and various substituents that could be substituted at certain positions in those generic structures. Ex. 1028 at 66-69.

In the first office action, dated September 18, 2020, the examiner rejected original claim 1 and most of the dependent claims for obviousness. Ex. 1028 at 141-42, 145-50. The examiner explained that the prior art described polymeric coatings prepared through plasma deposition using a monomer and a crosslinker and that it  
5 described applying such coatings to electronic devices. *Id.* at 146-47. The examiner also pointed out references that taught using the claimed aryl monomers, including benzyl acrylate and benzyl methacrylate, *Id.* at 147; Ex. 1002 ¶141, as well as cross-linkers recited in some of the original dependent claims, Ex. 1028 at 148-149. But the examiner also concluded that original dependent claims 7 and 10-15 contained  
10 allowable subject matter because the closest prior art of record did not show cross-linkers with the linker-moiety structures recited in those claims. *Id.* at 150-151.

After the examiner identified the allowable subject matter, the applicant cited Cohen, Legein, and Francesch in an IDS filed on October 8, 2020. Ex. 1028 at 196-205, 210. None of Cohen, Legein, or Francesch was ever cited in a rejection or otherwise discussed by the examiner in any office action or otherwise during prosecution.  
15 tion.

The applicant then responded to the examiner's pending rejections with an amendment filed on December 15, 2020. Ex. 1028 at 213-221, 229-30. The applicant did not dispute the substance of the examiner's obviousness rejections. *See id.* at  
20 219-21. Instead, the applicant responded by amending claim 1 to incorporate

crosslinker structures the examiner had identified as missing from the prior art in several of the original dependent claims. *Id.* at 213-17, 219, 221. Approximately two weeks later, on December 30, 2020, the examiner allowed the amended claims. *Id.* at 241-48.

5    **IV.    Level of ordinary skill in the art**

A person of ordinary skill in the art (“POSA”) in June 2015 would have had at least a bachelor’s degree in a field such as chemistry, physics, or chemical engineering, as well as at least two years of experience with plasma-polymerization techniques. Ex. 1002 ¶¶22-29.

10    **V.    Claim construction – “aryl”**

In an IPR, the Board construes claims “using the same claim construction standard that would be used in a civil action.” 37 C.F.R. § 42.100(b). Accordingly, “a claim receives the meaning it would have to persons in the field of the invention, when read and understood in light of the entire specification and prosecution history.”

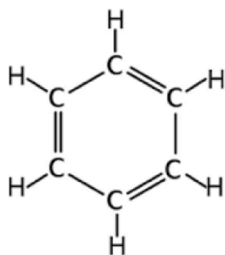
15    *Fenner Invs., Ltd. v. Cellco P’ship*, 778 F.3d 1320, 1323 (Fed. Cir. 2015).

Applying that standard, “aryl” should be construed in the ’087 patent’s claims to mean “an aromatic ring system.” That is consistent with the intrinsic record and the ordinary meaning of “aryl” to those skilled in the art.

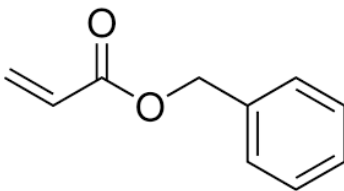
The ’087 claims use the term “aryl” to identify substituents that can be in-  
20    cluded at certain sites in the claimed monomers, including at the terminal “A”

position of both options recited in claim 1 for the variable R<sub>3</sub> group of the claimed monomer. Ex. 1001, 18:47, 18:60-61, 19:14. The specification contains similar, scattered uses of “aryl” without elaborating further or providing any structural diagrams or specific examples. *See* Ex. 1001 Abstract, 2:39, 2:52, 5:66, 9:36, 9:50, 10:26,  
5 12:66, 13:11.

The ordinary understanding of “aryl” among skilled artisans meant an aromatic ring system. In chemistry, an aromatic ring is an unsaturated cyclic structure with alternating single and double bonds, as exemplified by benzene (C<sub>6</sub>H<sub>6</sub>):



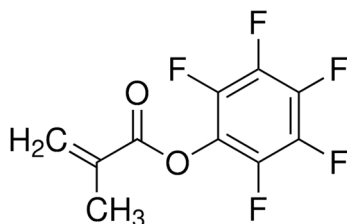
10 Ex. 1002 ¶¶137, 140. It was well known that aromatic rings could be incorporated into larger molecules. POSAs referred to a conjugated aromatic ring system as an aryl group. *Id.* ¶140. Common aryl groups were known to include phenyl and naphthyl, among others. *Id.* As one example of a compound with an aromatic ring system, benzyl acrylate contains a phenyl group linked with an acrylate ester group:



*Id.*

The prior art shows that skilled artisans used the term “aryl” when referring to an aromatic ring system. Ex. 1010, 5:9-11 (“The term ‘aryl’ refers to aromatic cyclic groups such as phenyl or naphthyl, in particular phenyl.”); Ex. 1016, 2:47-49 (same). The prosecution history supports the same understanding. During prosecution, original claim 1 required a monomer with an aryl group, Ex. 1028 at 65 (original claim 1), and the examiner cited prior art that described monomers including “benzyl (meth)acrylates” as meeting “the limitations of the formula of the monomer compound of the instant claims,” *id.* at 147. A skilled artisan would have understood the examiner’s reference to “benzyl (meth)acrylates” to include benzyl acrylate and benzyl methacrylate, both of which include an aromatic ring system. Ex. 1002 ¶141. And the applicant did not dispute that the claimed aryl monomers covered the prior art benzyl (meth)acrylates cited by the examiner. Ex. 1028 at 219-21.

In addition, the ’087 patent makes clear that “aryl” includes aromatic rings substituted to replace hydrogen with halogen atoms. Claim 1 expressly includes “aryl optionally substituted by halo.” Ex. 1001 18:61-62. And skilled artisans referred to compounds having halogenated aromatic ring systems as aryl compounds. Ex. 1038 at 453; Ex. 1002 ¶142. One example of a compound with a halo-substituted aryl group is PFM, which contains a fluorine-substituted phenyl:



Ex. 1038 at 453-54; Ex. 1002 ¶142.

Accordingly, a POSA reading the intrinsic record would have understood “aryl” as used in the ’087 claims to mean “an aromatic ring system.”

## 5 VI. Detailed discussion of the grounds for unpatentability

By the earliest asserted priority date for the ’087 patent, applying protective coatings to electronics through plasma polymerization was well known, and the prior art described using monomers and crosslinkers covered by the claims together to make crosslinked copolymers for electronics applications.

10 The ’087 patent was nevertheless allowed to issue because the examiner concluded that crosslinking reagents with linker moieties as in the issued claims were not found in the prior art. That conclusion was wrong. As detailed below, the prior art taught *every* limitation of the challenged claims—aryl acrylate monomers, cross-  
linkers having the recited structures, and the routine use of plasma polymerization  
15 to apply protective coatings to electronic devices. Copolymerizing known reagents through routine plasma-deposition methods to prepare water-repellant coatings for electronic devices would have been obvious to a POSA. The asserted grounds have

not previously been considered by the Office, and they demonstrate that the '087 patent never should have issued.

**A. Ground 1 – Claims 1-3, 5, 7, and 9-14 would have been obvious over Cohen and Legein**

5 Cohen and Legein together disclosed or suggested every limitation of '087 claims 1-3, 5, 7, and 9-14. Cohen taught that aryl acrylate monomers covered by the claims could be copolymerized with a claimed crosslinker (DVTMDS) using free-radical-initiated chain polymerization. And Cohen taught that the resulting cross-linked polymers could be used for insulating electronic components. Legein taught  
10 plasma polymerization as a preferred technique for applying protective polymer coatings to electronics, and it suggested doing so using acrylate and siloxane compounds—the same classes of compounds used to create Cohen's crosslinked copolymers. A POSA would have found it obvious to combine Cohen and Legein to arrive at the coated electronics covered by the '087 claims.

15 **1. Claim 1**

**[Preamble] “An electronic or electrical device or electronic or electrical component thereof comprising”**

To the extent this preamble is limiting, Cohen taught that its copolymers were useful “in electrical apparatus,” including components such as “capacitors and other  
20 electrical devices” and as “cable impregnants, in impregnating electrical coils, as filling compound in potheads and cable joints, and in numerous other electrical applications.” Ex. 1004, 5:7-25. Legein likewise specifically described polymer

coatings used for electrical devices. *E.g.*, Ex. 1005, 1:3-7, 4:5-7, 10:14-11:5; Ex. 1002 ¶148.

**[1a] “a protective cross-linked polymeric coating on a surface of the device or component; wherein the protective cross-linked polymeric coating is obtained by exposing the device or component to a plasma comprising a monomer compound and a crosslinking reagent for a period of time sufficient to allow formation of the protective cross-linked polymeric coating on a surface thereof,”**

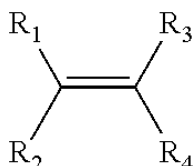
Cohen described preparing crosslinked polymers by copolymerizing an organosilane crosslinking reagent (DVTMDS) with a monomer compound, including acrylates and methacrylates. Ex. 1004, 3:52-65, 4:18-28, 4:38-57; Ex. 1002 ¶¶78, 149. In addition, Cohen taught that the resulting crosslinked polymers could be used for protecting electrical devices. Cohen’s polymers had protective dielectric (insulating) properties associated with high electrical resistance and could be used in numerous electrical applications, including to treat or fill an electrical device. Ex. 1004, 5:1-25; Ex. 1002 ¶150. Cohen taught that those crosslinked copolymers could be prepared using various polymerization techniques—“any of the methods now known in the art.” Ex. 1004, 1:31-34. At the time the Cohen patent issued in 1955, that included solution-based chain polymerization techniques using free-radical catalysts like peroxides. Ex. 1004, 1:35-62; Ex. 1002 ¶¶33-35, 151.

Legein described using plasma polymerization to apply protective polymeric coatings to electrical devices and components. Ex. 1005, 1:3-7, 4:5-7, 6:10-11. To carry out the coating process, Legein described loading electronic devices into a

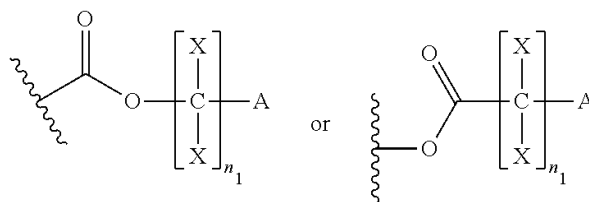
plasma chamber, where substrates were exposed to a plasma during operation to form a plasma-polymer coating. Ex. 1005 20:12-21, 21:20-22:1, 8:14-17; Ex. 1002 ¶152. Legein taught that those coatings could be made from one or more of the following types of precursor molecules: acrylates, methacrylates, or organosilanes. Ex. 1005 4:22-5:2, 10:14-20, 11:14-15; Ex. 1002 ¶153. And Legein described continuing the plasma treatment for a sufficient time to form a coating—depending on the desired coating thickness—because “[t]he longer the polymerisation time the thicker the resultant polymer coating.” Ex. 1005 9:15-27. According to Legein, the resulting plasma-polymer surface coatings were “corrosion resistant and/or liquid repellent.”

Ex. 1005 16:7-9.

**[1b] “wherein the monomer compound has the following formula:**

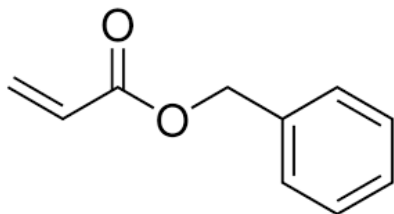


**where R<sub>1</sub>, R<sub>2</sub> and R<sub>4</sub> are each independently selected from hydrogen, optionally substituted branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl or halo alkyl or aryl optionally substituted by halo and R<sub>3</sub> is selected from:**

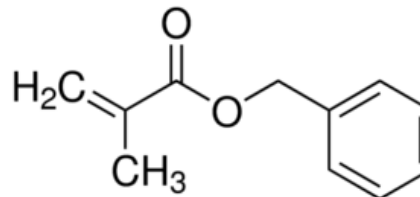


**where each X is independently selected from hydrogen, a halogen, optionally substituted branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl, halo alkyl or aryl optionally substituted by halo; where A is aryl optionally substituted by halo; and n<sub>1</sub> is an integer from 0 to 27”**

Cohen described using the aryl acrylate monomers benzyl acrylate and benzyl methacrylate having the following structures:

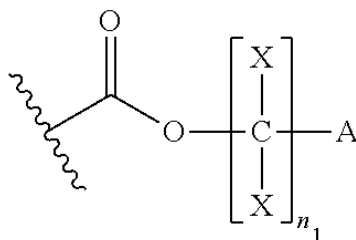


*Benzyl acrylate*



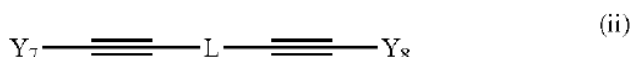
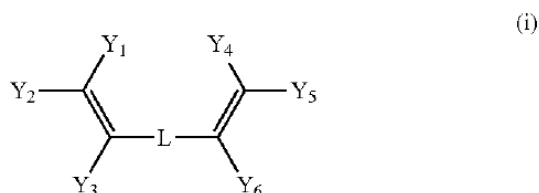
*Benzyl methacrylate*

- 5 Ex. 1004, 4:38-39; Ex. 1002 ¶¶155-156. Benzyl acrylate and benzyl methacrylate both satisfied the generic monomer structure recited in claim 1. In benzyl acrylate,  $R_1$ ,  $R_2$  and  $R_4$  are each hydrogen. In benzyl methacrylate,  $R_1$  and  $R_2$  are hydrogen, and  $R_4$  is a  $C_1$  alkyl group—specifically a methyl ( $CH_3$ ) group. Ex. 1002 ¶156. For  $R_3$ , both benzyl acrylate and benzyl methacrylate contain the generic acrylate structural option recited in claim 1 and shown below:
- 10



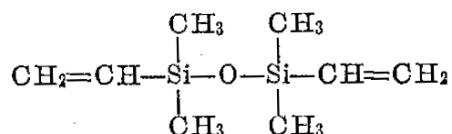
Ex. 1001, 18:50-57 (left side); Ex. 1002 ¶156. And in both disclosed monomers, the aryl group  $A$  is an aromatic ring, each  $X$  is hydrogen, and  $n_1$  is one. Ex. 1002 ¶156.

**[Ic] “and wherein the crosslinking reagent comprises two or more unsaturated bonds attached by means of one or more linker moieties and has a boiling point of less than 500° C. at standard pressure, the crosslinking reagent having one of the following structures:**



**where Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub>, Y<sub>5</sub>, Y<sub>6</sub>, Y<sub>7</sub> and Y<sub>8</sub> are each independently selected from hydrogen, optionally substituted cyclic, branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl or aryl; and L is a linker moiety;”**

Cohen described crosslinked copolymers made using the crosslinking reagent DVTMDS, which fits the “compound (i)” generic crosslinker formula shown above and recited in claim 1. Ex. 1002 ¶157. DVTMDS has the structure shown below:



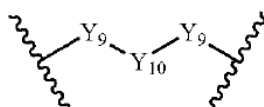
Ex. 1004, 1:21-34. As illustrated, DVTMDS contains two double bonds, a linker moiety between those double bonds, and hydrogen at each of the Y<sub>1-6</sub> positions. Ex. 1002 ¶157. And as a POSA would have known, the boiling point of DVTMDS at standard (atmospheric) pressure is approximately 137°C (well below 500°C). Ex. 1004, 3:44-45; Ex. 1002 ¶158.

[1d] [Formula A] “wherein for compound (i) L is of formula A having one of the following structures:



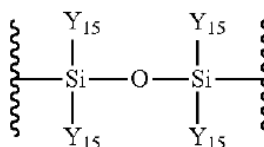
and Y<sub>10</sub> is selected from optionally substituted cyclic, branched or straight chain C<sub>1</sub>-C<sub>8</sub> alkylene and a siloxane group;

or [Formula B] wherein for compound (i) L is of formula B having the following formula:



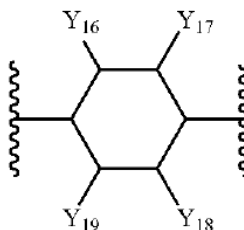
where each Y<sub>9</sub> is independently selected from, a bond, —O—, —O—C(O)—, —C(O)—O—, —Y<sub>11</sub>—O—C(O)—, —C(O)—O—Y<sub>11</sub>—, —OY<sub>11</sub>—, and Y<sub>11</sub>O—, where Y<sub>11</sub> is an optionally substituted cyclic, branched or straight chain C<sub>1</sub>-C<sub>8</sub> alkylene; and

[Formula B1] wherein Y<sub>10</sub> has the following formula:



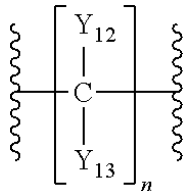
and each Y<sub>15</sub> is independently selected from optionally substituted branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl;

or [Formula B2] wherein Y<sub>10</sub> has the following formula:



and Y<sub>16</sub> to Y<sub>19</sub> are each independently selected from H and optionally substituted branched or straight chain C<sub>1</sub>-C<sub>8</sub> alkyl or alkenyl;

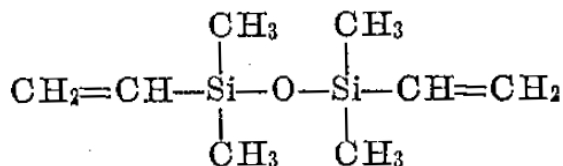
or [Formula B3] wherein Y<sub>10</sub> has the following formula:



and each Y<sub>12</sub> is fluoro and each Y<sub>13</sub> is fluoro, and n is an integer from 1 to 10.”

5 Claim 1 concludes by reciting several alternative, generic structural options for the linker moiety of the compound (i) crosslinking reagents. Those structures are divided into formula A (two options) and formula B (a third option), and the claim then further recites three alternative generic substructures for the variable Y<sub>10</sub> group within formula B (denoted above as formulas B1, B2, and B3). Ex. 1001, 19:15-  
10 20:11; Ex. 1002 ¶¶67-69, 159.

Cohen disclosed DVTMDS, which is a compound (i) crosslinker with two double bonds that fits within the scope of formula B1. For comparison, the structure of DVTMDS is shown below.



15 Ex. 1004, 1:26-30. DVTMDS contains a tetramethyl disiloxane linker moiety bridging the molecule’s two double bonds. Ex. 1002 ¶160. The linker moiety in DVTMDS satisfies formula B1 as recited in claim 1 because it has: (1) a bond at each Y<sub>9</sub> position of formula B; (2) the formula B1 disiloxane structure at the Y<sub>10</sub> position of formula

B; and (3) C<sub>1</sub>-C<sub>6</sub> alkyl groups, specifically methyl (CH<sub>3</sub>) groups, at all four Y<sub>15</sub> positions of formula B1. Ex. 1002 ¶160. Furthermore, DVTMDS necessarily fell within the scope of claim 1 because claim 7, which depends from claim 1, specifically recites DVTMDS as a covered crosslinker. Ex. 1001 20:49-50; *Alcon Research, Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1367 (Fed. Cir. 2012).

**Motivation to combine.** As documented by Legein and numerous other prior-art references, there was by 2015 a clear market incentive to protect widespread, sensitive electronic devices from damage due to environmental exposure—driven especially by the ongoing proliferation of portable electronics. Ex. 1005, 1:14-17, 4:5-7, 4:22-26, 6:1-8, 12:14-25; Ex. 1002 ¶¶58, 61, 162. That design incentive would have motivated a POSA to develop robust protective coatings for electronic devices. Ex. 1002 ¶162; *see KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 417-18 (2007).

Cohen described preparing crosslinked copolymers that could be readily prepared by various free-radical initiated chain polymerization techniques. Ex. 1004, 1:31-60; Ex. 1002 ¶163. A POSA seeking to prepare protective coatings for electronics would have sought to use Cohen’s copolymers for several reasons. Cohen described polymers that were useful for insulating electronic devices and components. Ex. 1004, 5:1-25; Ex. 1002 ¶¶163-164. A POSA also would have known that coatings containing DVTMDS or other organosilicon compounds were associated with water-repellent, barrier, and electrically insulating properties. Ex. 1002 ¶164;

*see also* Ex. 1004, 5:1-12 (insulating); Ex. 1020 ¶¶ 37, 40-45, (insulating); Ex. 1017, 3:27-41, 6:31-36 (moisture-resistant, barrier); Ex. 1005, 4:5-5:13 (insulating, water-repellent); Ex. 1018, 1:6-11 (insulating). In addition, Cohen's polymers were cross-linked, Ex. 1004, 3:58-62, which a POSA would have known to improve durability and barrier properties of polymer coatings, Ex. 1002 ¶¶ 50-55, 164. POSAs would have viewed protective coatings with enhanced durability as highly desirable, particularly for devices like mobile phones that typically receive daily use under various conditions for years on end. Ex. 1002 ¶ 164. And a POSA would have known that such copolymers could be prepared using known, relatively inexpensive, and readily available compounds including DVTMDS and simple acrylates that had long been used in polymer production. Ex. 1002 ¶¶ 78, 163, 169.

Among the monomers that Cohen specifically described as useful copolymerization partners with DVTMDS, Ex. 1004, 2:19-30, 3:53-54, 3:68, 4:7, 4:37-57, a POSA would have found it obvious to pursue benzyl acrylate and benzyl methacrylate for several reasons. Cohen identified 63 specific compounds as suitable for copolymerizing with DVTMDS to make the inventive compositions. Ex. 1002 ¶ 171. First, a POSA would have been motivated to choose a non-halogenated monomer from the options Cohen described due to environmental concerns surrounding halogen-substituted organic compounds that were well-known by 2015. Ex. 1002 ¶ 166. Those concerns would have led a POSA to prefer compounds other than the various

chloro-substituted monomers listed among Cohen's specific options. See Ex. 1004, 4:38-57; Ex. 1002 ¶166.

Second, a POSA would have been motivated to use a monomer that was itself capable of functioning as a crosslinking reagent for pairing with DVTMDS. Ex. 1002 ¶167. Cohen itself suggested the benefits of using a compound that provides additional crosslinking capability, Ex. 1004, 2:50-56, and a POSA would have known that using two multifunctional compounds together could be particularly effective in polymer coatings used to protect electronics, Ex. 1014 ¶52. A POSA also would have known that benzyl acrylate and benzyl methacrylate, as aryl monomers, were known to mediate crosslinking. Ex. 1002 ¶167.

Third, a POSA would have known that Legein specifically identified acrylate and methacrylate monomers as preferred for use together with organosilanes for applying protective coatings to electronics (Ex. 1005, 4:22-5:1, 10:14-26) and would have known that DVTMDS is an organosilane (Ex. 1002 ¶78). A POSA also would have known that acrylate and methacrylate monomers had a track record of demonstrated success when used to make protective coatings for electronics through plasma polymerization. Ex. 1002 ¶168; Ex. 1005 Abstract, 4:22-5:1, 10:14-26; Ex. 1011, 3:14-4:27, 12:7-22; Ex. 1012, 2:6-15. Accordingly, a POSA would have been motivated to select acrylates and methacrylates among the non-halogenated, multifunctional compounds identified by Cohen for use with DVTMDS. Ex. 1002 ¶168.

That would have left eight specific candidates, including benzyl acrylate and benzyl methacrylate. *Id.*

To a POSA, it would have been obvious to try all eight of those specifically disclosed options. At that point, the POSA would have a very limited number of identified, practicable solutions for making a copolymer with DVTMDS in view of Cohen and Legein. *KSR*, 550 U.S. at 421. And it would have been well within the ordinary skill in the art for a POSA to prepare and test DVTMDS copolymers with each of those compounds via plasma polymerization, including benzyl acrylate and benzyl methacrylate. Ex. 1002 ¶169. Accordingly, a POSA would have been motivated to use benzyl acrylate and benzyl methacrylate because those monomers would have been obvious to try among the disclosed prior-art choices.

Alternatively, a POSA further would have been motivated to select benzyl acrylate and benzyl methacrylate specifically from the disclosed choices because a POSA would have considered the aryl groups in those monomers to be advantageous for achieving barrier properties and water repellency in the finished coatings. Ex. 1002 ¶170. Aryl groups in polymerized monomers were known to assume a rigid, compact configuration that a POSA would have expected to provide strong barrier properties. *Id.*; Ex. 1031 at 781; Ex. 1032 at 269. Furthermore, a POSA would have viewed benzyl acrylate and benzyl methacrylate as hydrophobic monomers well suited to providing hydrophobic properties in a protective coating. Ex. 1002 ¶170.

Selecting benzyl acrylate or benzyl methacrylate would have been obvious for that additional reason.

In addition, a POSA would have found it obvious to try benzyl acrylate and benzyl methacrylate from among the full list of 63 options Cohen described for pairing with DVTMDS. Ex. 1002 ¶171. It would have been well within the skill of a POSA to prepare and test plasma co-polymers with DVTMDS and each of those choices, and a POSA certainly would have found it obvious to try benzyl acrylate and benzyl methacrylate because those monomers would have been available through commercial suppliers by 2015. *Id.*

Finally, when adopting Cohen's copolymer compositions to prepare protective coatings for electronic devices, a POSA would have been motivated to use plasma polymerization as taught by Legein. Ex. 1002 ¶¶172-73. A POSA would have known that plasma polymerization is a dry process, which avoids solvents and avoids having to contact sensitive electronics with liquid polymer precursors as would be required when using older solution-based techniques like those described by Cohen. *Id.* at ¶173; Ex. 1010, 2:10-14. Plasma polymerization was also well known to be very effective for coating electronics because the coating is applied using gaseous plasma that creates a uniform, conformal coatings across all surfaces and can even reach surfaces inside of a fully assembled device. Ex. 1002 ¶173; Ex. 1005, 21:20-22:2, 4:1-3, 4:12-13. Legein taught that plasma techniques could

provide for improved polymer adhesion to electronic devices, Ex. 1005, 6:18-26, 4:1-3, and described plasma polymerization as a “quick and simple, yet cost effective, solution to providing a device with a corrosion resistant protective coating,” Ex. 1005, 37:15-20. And Legein described acrylates, methacrylates, and organosilanes  
5 as preferred classes of compounds that could be used in combination to apply protective coatings to electronics and provide effective liquid-repellent coatings on electronic devices through plasma polymerization. Ex. 1005 Abstract, 4:22-5:2, 6:10-11, 10:14-26.

In short, a POSA would have been motivated to make polymer-coated electronics using Cohen’s disclosed copolymers, containing DVTMDS and benzyl acrylate or benzyl methacrylate, via plasma polymerization as taught by Legein.  
10

***Reasonable expectation of success.*** A POSA reasonably would have expected to succeed in combining Cohen and Legein as in claim 1 because the claimed combination represented no more than known elements with each performing its  
15 known and expected function.

Plasma polymerization was routine and well within the skill of a POSA by June 2015. Ex. 1002 ¶¶36, 44, 58-61, 176; Ex. 1001, 14:59-67; Ex. 1010, 2:10-13, 10:8-12. A POSA would have expected known monomers benzyl acrylate and benzyl methacrylate to yield protective coatings when co-polymerized under plasma  
20 with DVTMDS because Legein taught that acrylates, methacrylates, and

organosilanes would be suitable for that purpose and because Cohen taught that those compounds could be copolymerized. Ex. 1002 ¶¶153, 175, 177; Ex. 1005, Abstract, 4:22-5:3; Ex. 1004 1:31-34, 2:14-27. A POSA thus would have expected DVTMDS to serve as an effective crosslinker with benzyl acrylate and benzyl methacrylate by plasma polymerization because Cohen taught preparing copolymers using those reagents and a POSA would have known that DVTMDS and (meth)acrylates had been used for plasma polymerization. Ex. 1002 ¶¶46, 176; Ex. 1004, 1:25-34, 4:36-39; 1005, 10:14-11:15; Ex. 1039 at 28; Ex. 1046 at 4-5; Ex. 1020 ¶¶40-43. In addition, a POSA would have expected that a polymerization reaction successfully carried out using one activation method for chain polymerization (like free-radical catalysts) generally can be carried out using another (like plasma polymerization). Ex. 1002 ¶¶35, 56, 64, 176.

Given the known properties associated with benzyl acrylate, benzyl methacrylate, and DVTMDS as described above, a POSA would have expected coatings formed of such crosslinked aryl acrylates to exhibit protective water-repellent and barrier properties. Ex. 1002 ¶¶170, 177-81, 184-85; Ex. 1054 ¶4; Ex. 1056 at 4:24-6:3. And a POSA would have expected the resulting plasma-polymer coatings to be successful as applied to electronic devices because Cohen and Legein described protective electronics applications for such copolymer compositions. Ex. 1004, 5:1-25; Ex. 1005, 10:14-26.

In view of the foregoing, claim 1 would have been obvious over Cohen and Legein.

## 2. Claim 2

5       **“A device or component according to claim 1, wherein the protective cross-linked polymeric coating is a physical barrier to mass and electron transport.”**

As explained above, it would have been obvious to prepare the coated device of claim 1 in view of Cohen and Legein. Claim 2 specifies barrier properties of the coating in claim 1. That would have been an expected and routine result of the ob-  
10       vious combination of Cohen and Legein.

A POSA would have understood that a barrier to mass transport includes restricting passage of molecules, like water or oxygen, and that a barrier to electron transport restricts passage of electrons—in other words, an electrical insulator. Ex.1002 ¶178; *see also* Ex. 1001, 3:10-19, 3:47. A POSA would have viewed those  
15       as desirable properties when preparing a protective coating for electronics. Ex. 1002 ¶178. A POSA also would have known that copolymer coatings could be prepared using an organosilane like DVTMDS and an acrylate or methacrylate monomer such as benzyl acrylate or benzyl methacrylate to have insulating and molecular barrier properties. Ex. 1002 ¶¶164, 170, 179; Ex. 1004 5:2-25. Furthermore, a POSA would  
20       have expected crosslinking to improve barrier properties of such coatings by reducing crystallinity and the associated likelihood of channels for molecules or electrical

conductance through the coatings, and DVTMDS had been used as a crosslinker in coatings to prevent the passage of molecules and/or provide electrical insulation. Ex. 1002 ¶¶52-53, 164, 180.

5 A POSA therefore would have sought and expected coatings based on the asserted combinations to exhibit the claimed barrier properties. Ex. 1002 ¶¶178-181. The '087 patent admits that producing those properties using the prior-art monomers and crosslinkers of claim 1 would have been within the skill of a POSA. Ex. 1001, 14:30-36. Similarly, the '087 patent indicates that a coating thickness of at least 50 nm typically suffices to provide a barrier coating, Ex. 1001, 3:13-15, and a POSA 10 would have known that greater coating thickness facilitates barrier properties and would have known how to increase coating thickness simply by increasing plasma polymerization time. Ex. 1002 ¶181; Ex. 1005, 9:15-17, 28:23-25; Ex. 1006 at 608. The barrier properties recited in claim 2 thus would have been expected and obvious for a POSA to achieve using the monomer, crosslinker, and plasma polymerization 15 techniques of the asserted prior-art combination.

### 3. Claim 3

**“A device or component according to claim 1, wherein the protective cross-linked polymeric coating forms a liquid repellent surface defined by a static water contact angle (WCA) of at least 90°.”**

20 As explained above, it would have been obvious to prepare the coated device of claim 1 in view of Cohen and Legein. Claim 3 specifies a surface WCA of at least

90° for the same coated device of claim 1. That recited property would have been an expected and routine result of the obvious combination of Cohen and Legein or would have been inherent in that combination. Either way, claim 3 would have been obvious over Cohen and Legein.

5           By June 2015, WCA was a well-known measure of surface hydrophobicity, and POSAs understood that water-repellent surfaces exhibit WCA greater than 90°. Ex. 1002 ¶¶182-83; Ex. 1001, 4:28-31. As described by Legein, acrylate, methacrylate, and siloxane compounds were known to be well suited for forming water-repellent coatings, Ex. 1005, 16:7-14, and the compounds used in the prior-art combination asserted above against claim 1 (DVTMDS, benzyl acrylate, and benzyl methacrylate) fit within those categories and would have been recognized by a POSA as hydrophobic. Ex. 1002 ¶¶170, 177-81, 184-85. A POSA therefore would have found it obvious to combine a hydrophobic aryl acrylate monomer with a hydrophobic crosslinker, such as DVTMDS, to generate a coating with a WCA of at least 90°. Ex. 1002 ¶¶184-85. The '087 patent confirms that producing the claimed WCA would have been within the knowledge and skill of a POSA. Ex. 1001, 14:34-36; Ex 1002 ¶184. The WCA recited in claim 3 thus would have been an obvious and expected property for a POSA to achieve with co-polymer coatings prepared according to the combined teachings of the asserted prior art. Ex. 1002 ¶¶184-85; *see Southwire Co. v. Cerro Wire LLC*, 870 F.3d 1306, 1312 (Fed. Cir. 2017) (claims reciting “mere

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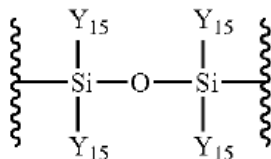
20

quantification of the results of a known process” held obvious); *Ritchie v. Vast Res., Inc.*, 563 F.3d 1334, 1337 (Fed. Cir. 2009) (known properties of known components did not suffice to render combination nonobvious).

Alternatively, the WCA recited in claim 3 would have been an inherent result  
5 of the combination of claim 1. The molecular composition of a polymer determines hydrophobicity. Ex. 1002 ¶185. It was known that benzyl acrylate and benzyl methacrylate and yield hydrophobic coatings when applied as a surface coating. Ex. 1030 at 802; Ex. 1002 ¶¶170, 177-81, 184-85. Similarly, DVTMDS was also known to yield hydrophobic coatings. Ex. 1045 at 135; Ex. 1002 177. As a POSA would have  
10 known, combining a hydrophobic crosslinker (DVTMDS) with a highly hydrophobic aryl acrylate monomer (benzyl acrylate or benzyl methacrylate) to form a copolymer coating would naturally and necessarily yield hydrophobicity, manifesting with a WCA of at least 90°, in the resulting products. Ex. 1002¶185. Because the property recited in claim 3 is the natural, inherent result of combining hydrophobic  
15 components in the polymer composition recited in claim 1, claim 3 would have been obvious over the same asserted combination of prior art. *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1354 (Fed. Cir. 2012) (“merely ... testing and claiming an inherent property” cannot render an otherwise obvious formulation patentable).

#### 4. Claim 5

**“A device or component according to claim 1, wherein Y<sub>10</sub> has the following formula:**



**each Y<sub>15</sub> is methyl, and each Y<sub>9</sub> is a bond.”**

As explained above with regard to claim 1, DVTMDS contains a formula B1 linker moiety in which each Y<sub>9</sub> is a bond and each Y<sub>15</sub> is a methyl group, as recited in claim 5. Ex. 1002 ¶160. Accordingly, claim 5 would have been obvious over Cohen and Legein for the same reasons as claim 1.

#### 5. Claim 7

**“The device or component according to claim 1, wherein the crosslinking reagent is selected from 1,4-butanediol divinyl ether (BDVE), 1,4-cyclohexanedimethanol divinyl ether (CDDE), 1,2,4-trivinylcyclohexane (TVCH), 1,3-divinyldimethyltetramethyldiorganosilane (DVTMDS), diallyl 1,4-cyclohexanedicarboxylate (DCHD), 1,6-divinylperfluorohexane (DVPFH), 1H,1H,6H,6H-perfluorohexanediol diacrylate (PFHDA) and glyoxal bis (diallyl acetal) (GBDA).”**

DVTMDS is one of the specific crosslinking reagents recited in claim 7. Accordingly, claim 7 would have been obvious over the asserted combination of Cohen and Legein for the same reasons as claim 1.

#### 6. Claim 9

**“A device or component according to claim 1, wherein each X is H.”**

Petitioner submits that the language recited in claim 9 should be entitled to no

patentable weight. Claim 9 purports to limit claim 1 such that “each X” recited in claim 1 is H. Ex. 1001 20:57-58. But claim 1 expressly specifies that  $n_1$  can be zero. Ex. 1001, 18:62. Thus, neither claim 1 nor claim 9 includes any requirement that an X group be present. *Id.* at 18:62, 20:57-58. Optional elements “do not narrow the claim because they can always be omitted.” *In re Johnston*, 435 F.3d 1381, 1384 (Fed. Cir. 2006). Claim 9 would have been obvious over the same combination asserted against claim 1 for that reason alone.

In addition, even if the language in claim 9 were considered limiting, the asserted combination of Cohen and Legein includes benzyl acrylate and benzyl methacrylate, both expressly disclosed by Cohen. Both include one  $CX_2$  group (i.e.,  $n_1 = 1$ ). Ex. 1002 ¶¶155-56, 188; *see* Ex. 1001 18:45-62. And in both, the single  $CX_2$  group is  $CH_2$ , meaning that each X is hydrogen as recited in claim 9. Ex. 1002 ¶156, 188. Accordingly, even if claim 9 could be considered limiting, it would have been obvious for the same reasons as claim 1.

## 7. Claim 10

**“A device or component according to claim 1, wherein each X is F.”**

As with claim 9, the language of claim 10 should be entitled to no patentable weight. Claim 10 purports to limit claim 1 such that “each X” recited in claim 1 is F, but X is optional and thus non-limiting because  $n_1$  can equal zero. Ex. 1001, 18:62, 20:59-60; *Johnston*, 435 F.3d at 1384. Claim 10 thus would have been obvious for

the same reasons as claim 1. In addition, even if limiting, claim 10 would have been obvious to a POSA because a POSA would have been motivated to fluorinate the CX<sub>2</sub> group in benzyl acrylate or benzyl methacrylate to increase the hydrophobicity of the monomers, and thus the resulting polymer. Ex. 1002 ¶189. That would have  
 5 been a routine, predictable modification in the eyes of a POSA. *Id.*

## 8. Claim 11

**“A device or component according to claim 1, wherein the device or component is selected from a mobile phone, smartphone, pager, radio, sound and audio system, hearing aid, personal audio equipment, television, DVD player including portable a DVD player, video recorder, digi or other set-top boxes, computer or related component, personal digital assistant (PDA), keyboard, instrument, games console, data storage device, outdoor lighting system, radio antennae or other form of communication equipment, or printed circuit board.”**

As noted with regard to obviousness of claim 1, Cohen and Legein both described polymers for use with electronic devices and components. In particular, Legein taught applying such protective polymer coatings to electronic devices including a mobile phone, a personal digital assistant, and a keyboard. Ex. 1005, 10:22-26; Ex. 1002 ¶190. Claim 11 therefore would have been obvious for the same  
 20 reasons as claim 1.

## 9. Claim 12

**“A device or component according to claim 11, wherein the sound and audio system is a loudspeaker, microphone, ringer and/or buzzer.”**

As noted with regard to obviousness of claim 1, Cohen and Legein both described polymers produced for use in electronic devices and components. In  
 25

particular, Legein taught applying such protective polymer coatings to electronic devices including a loudspeaker. Ex. 1005, 10:23; Ex. 1002 ¶191. Claim 12 therefore would have been obvious for the same reasons as claim 1.

#### 10. Claim 13

5       **“A device or component according to claim 11, wherein the personal audio equipment is a personal CD, tape cassette or MP3 player.”**

As noted with regard to obviousness of claim 1, Cohen and Legein both described polymers produced for use in electronic devices and components. In particular, Legein taught applying such protective polymer coatings to electronic devices  
10 including an MP3 player. Ex. 1005, 10:24; Ex. 1002 ¶192. Claim 13 therefore would have been obvious for the same reasons as claim 1.

#### 11. Claim 14

15       **“A device or component according to claim 11, wherein the computer or related component is a laptop, notebook, tablet, phablet or palmtop computer.”**

As noted with regard to obviousness of claim 1, Cohen and Legein both described polymers produced for use in electronic devices and components. In particular, Legein taught applying such protective polymer coatings to electronic devices including a tablet computer. Ex. 1005, 10:23; Ex. 1002 ¶193. Claim 14 therefore  
20 would have been obvious for the same reasons as claim 1.

**B. Ground 2 – Claims 1-4, 7, and 9-14 would have been obvious over Francesch and Legein**

Francesch and Legein together taught every limitation in claims 1-4, 7, and 9-14 of the '087 patent. Francesch described using plasma polymerization to apply crosslinked copolymer coatings to a silicon substate using (1) the aryl acrylate monomer pentafluorophenyl methacrylate (PFM), and (2) the crosslinkers 1,4-butanediol divinyl ether (BDVE) or 1,7-octadiene. And Legein taught using plasma-polymer coatings specifically for protecting electronics from water damage.

**1. Claim 1**

**[Preamble] “An electronic or electrical device or electronic or electrical component thereof comprising”**

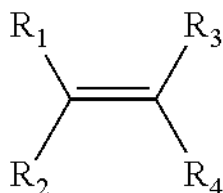
To the extent this preamble is limiting, Francesch described using plasma polymerization to apply crosslinked, polymeric surface coatings—using a silicon substrate for demonstration purposes. Ex. 1006 at 607. And using plasma polymerization specifically to coat electronic devices (which often include silicon substrates) was old and well-known in the art. Ex. 1002 ¶¶195-97, 208; Ex. 1005 Abstract, 1:1-7, 1:14-17, 4:5-7, 12:14-19, 20:12-26, 31:8-22; Ex. 1011, 1:3-3:18, 4:17-5:26.

**[1a] “a protective cross-linked polymeric coating on a surface of the device or component; wherein the protective cross-linked polymeric coating is obtained by exposing the device or component to a plasma comprising a monomer compound and a crosslinking reagent for a period of time sufficient to allow formation of the protective cross-linked polymeric coating on a surface thereof,”**

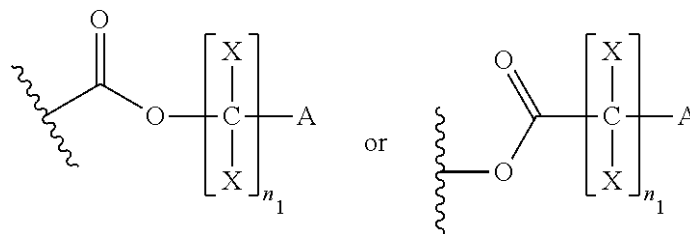
The '087 patent explains that a coating can be protective by repelling water or by forming a barrier to insulate electrical parts of a device. Ex. 1001, 1:14-22. Both Francesch and Legein described polymer coatings applied by plasma polymerization using a hydrophobic monomer with a crosslinking reagent.

Francesch described using plasma deposition to apply crosslinked polymeric coatings to silicon wafers using a hydrophobic aryl acrylate monomer (PFM) and two different crosslinkers (BDVE and 1,7-octadiene). Ex. 1006 at 606-07. Francesch confirmed that plasma polymerization with those compounds resulted in coatings on the substrate surface. Ex. 1006 at 609-10. Francesch also taught that the resulting coatings were crosslinked. Ex. 1006 at 610; Ex. 1002 ¶199. As detailed above under Section VI.A.1., Legein described applying protective coatings by plasma polymerization specifically to electronic devices for protecting such devices against corrosion and liquid damage. *E.g.*, Ex. 1005 Abstract, 4:22-26, 6:10-11; Ex. 1002 ¶200.

**[1b] “wherein the monomer compound has the following formula:**

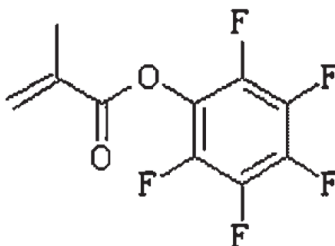


where R<sub>1</sub>, R<sub>2</sub> and R<sub>4</sub> are each independently selected from hydrogen, optionally substituted branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl or halo alkyl or aryl optionally substituted by halo and R<sub>3</sub> is selected from:



where each X is independently selected from hydrogen, a halogen, optionally substituted branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl, halo alkyl or aryl optionally substituted by halo; where A is aryl optionally substituted by halo; and n<sub>1</sub> is an integer from 0 to 27”

Francesch described using PFM, a fluoro-aryl methacrylate monomer with the following structure:



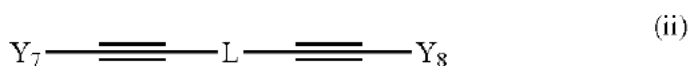
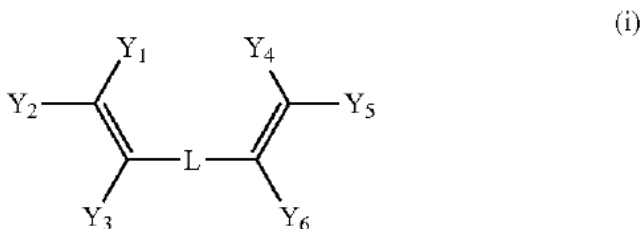
Francesch at 606. PFM fits the monomer structure required by claim 1. As shown above, PFM contains a double bond, has hydrogen at its R<sub>1</sub> and R<sub>2</sub> positions, and has a C<sub>1</sub> alkyl group at its R<sub>4</sub> position—specifically, a methyl (CH<sub>3</sub>) group. At the R<sub>3</sub> position, PFM mirrors the claimed generic acrylate structure (the left of the two R<sub>3</sub> options illustrated in claim 1), where n<sub>1</sub> is zero and A is an aryl group. Ex. 1002

¶201. Claim 1 permits the claimed monomer’s aryl group A to be “optionally substituted by halo,” Ex. 1001, 18:61-62, and the aryl group in PFM is substituted with

the halogen fluorine (shown as F) at five positions around its phenyl ring. Ex. 1002 ¶202.

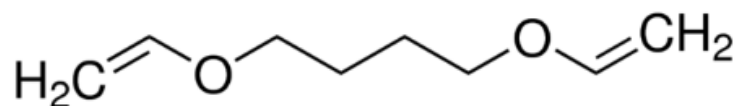
As explained in Section VI.A.1., above, Legein described using plasma polymerization to apply protective polymer coatings specifically to electronic devices. Ex. 1005 Abstract, 4:22-26, 6:10-11. In addition, Legein taught preparing such coatings using methacrylate monomers, a class of compounds that includes PFM. Ex. 1005, 4:22-5:2, 10:14-26.

**[Ic] “and wherein the crosslinking reagent comprises two or more unsaturated bonds attached by means of one or more linker moieties and has a boiling point of less than 500° C. at standard pressure, the crosslinking reagent having one of the following structures:**



**where Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>, Y<sub>4</sub>, Y<sub>5</sub>, Y<sub>6</sub>, Y<sub>7</sub> and Y<sub>8</sub> are each independently selected from hydrogen, optionally substituted cyclic, branched or straight chain C<sub>1</sub>-C<sub>6</sub> alkyl or aryl; and L is a linker moiety;”**

Francesch described copolymerizing the PFM monomer with 1,4-butanediol divinyl ether (BDVE). Ex. 1006 at 606-07. The structure of BDVE is shown below:



*1,4-butanediol divinyl ether (BDVE)*

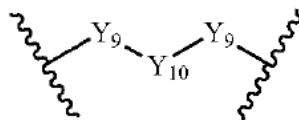
Ex. 1002 ¶203. BDVE is a crosslinker. Ex. 1006 at 909; Ex. 1002 ¶52. And BDVE matched the structural criteria for crosslinker compound (i) of claim 1: it contains two double bonds separated by a linker moiety, and each of positions Y<sub>1</sub>-Y<sub>6</sub> is hydrogen. Ex. 1002 ¶203. In addition, a POSA would have known that the boiling point of BDVE at standard pressure is approximately 190°C. Ex. 1002 ¶¶204-05.

**[1d] [Formula A] “wherein for compound (i) L is of formula A having one of the following structures:**



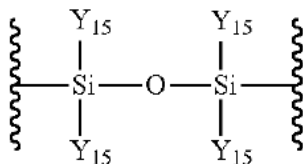
**and Y<sub>10</sub> is selected from optionally substituted cyclic, branched or straight chain C<sub>1</sub>-C<sub>8</sub> alkylene and a siloxane group; or**

**[Formula B] wherein for compound (i) L is of formula B having the following formula:**



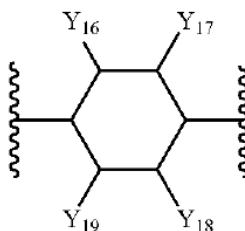
where each  $Y_9$  is independently selected from, a bond,  $—O—$ ,  $—O—C(O)—$ ,  $—C(O)—O—$ ,  $—Y_{11}—O—C(O)—$ ,  $—C(O)—O—Y_{11}—$ ,  $—OY_{11}—$ , and  $—Y_{11}O—$ , where  $Y_{11}$  is an optionally substituted cyclic, branched or straight chain  $C_1$ - $C_8$  alkylene; and

5 [Formula B1] wherein  $Y_{10}$  has the following formula:



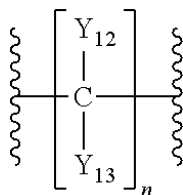
and each  $Y_{15}$  is independently selected from optionally substituted branched or straight chain  $C_1$ - $C_6$  alkyl; or

[Formula B2] wherein  $Y_{10}$  has the following formula:



and  $Y_{16}$  to  $Y_{19}$  are each independently selected from H and optionally substituted branched or straight chain  $C_1$ - $C_8$  alkyl or alkenyl; or

[Formula B3] wherein  $Y_{10}$  has the following formula:

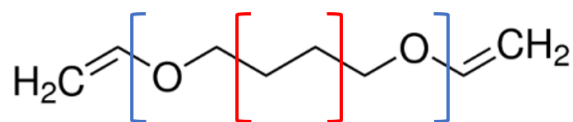


15 and each  $Y_{12}$  is fluoro and each  $Y_{13}$  is fluoro, and  $n$  is an integer from 1 to 10.”

Claim 1 concludes by reciting several alternative, generic structural options for the linker moiety of the compound (i) crosslinking reagents. Those structures are divided into formula A (two options) and formula B (a third option), and the claim

then further recites three alternative generic substructures for the variable Y<sub>10</sub> group within formula B (denoted above as formulas B1, B2, and B3). Relative to claim 1, Francesch's disclosed BDVE crosslinker is a compound (i) crosslinker that contains two double bonds and fits within the scope of formula A.

5           The linker moiety of BDVE (bracketed in blue below) matches the second (lower) option for Formula A shown in claim 1. Ex. 1001, 19:23-25; Ex. 1002 ¶¶206-07. BDVE's linker moiety includes a two-carbon chain (bracketed in red below) that corresponds to Y<sub>10</sub> of formula A in claim 1, where Y<sub>10</sub> is a straight-chain C<sub>2</sub> alkylene (–CH<sub>2</sub>–CH<sub>2</sub>–).



10           Ex. 1002 ¶207. Furthermore, BDVE necessarily fell within the scope of claim 1 because claim 7, which depends from claim 1, specifically recites BDVE as a covered crosslinker. Ex. 1001 20:46-48; *Alcon*, 687 F.3d at 1367.

**Motivation to combine.** By 2015, POSAs would have been motivated to apply  
 15   protective polymer coatings to electronic devices using plasma polymerization, as expressly described by Legein. Ex. 1002 ¶208. And a POSA seeking to make such coatings would have been motivated to use Francesch's crosslinked copolymer coatings based on the PFM monomer because of its expected hydrophobicity and demonstrated performance under plasma polymerization to apply coatings onto silicon

substrates similar to those used in electronic components. Ex. 1002 ¶¶208, 212-13; Ex. 1006 at 607, 609-10.

POSAs would have been motivated to use Francesch's PFM-based polymer coatings for several reasons. A POSA would have recognized PFM as a monomer that would yield highly water-repellent coatings. Ex. 1002 ¶211. Francesch's PFM-based coatings also would have been attractive because they were crosslinked, which a POSA would have known to improve the durability of the resulting coatings. Ex. 1002 ¶209; Ex. 1006 at 610 (noting that crosslinking "improve[d] the solvent resistance of the resulting deposited thin films"). In addition, a POSA would have recognized that PFM contains an aryl group, which was known to facilitate additional crosslinking as another unsaturated reactive group and further promote water repellency due to surface packing and bulkiness of the aromatic rings in the finished polymer films. Ex. 1002 ¶¶170, 210. Francesch also taught that the disclosed PFM-based copolymer coatings yielded uniform, flat, pinhole-free surfaces. Francesch at 609-10; Ex. 1002 ¶209. Finally, Francesch taught that its disclosed crosslinked coatings were readily applied via plasma polymerization using "easy reaction conditions." Ex. 1006 at 610.

In addition, a POSA would have found it obvious to use the crosslinked copolymer made using PFM and BDVE because Francesch described only two options for the crosslinker used with PFM: BDVE or 1,7-octadiene. Ex. 1006 at 607.

Francesch showed that combining both with PFM under plasma conditions successfully produced crosslinked copolymer coatings on silicon-wafer substrates. Ex. 1006 at 608-10. Francesch thus provided a “finite number of identified, predictable solutions” for the crosslinker to use in PFM-based coatings, *KSR*, 550 U.S. at 421, and it would have been obvious for a POSA to pursue the PFM/BDVE copolymer as a known option with demonstrated success on similar substrates, Ex. 1002 ¶214. A POSA also would have been motivated to select BDVE specifically because, between BDVE and 1,7-octadiene, BDVE has a boiling point closer to the boiling point of PFM, which a POSA would have known would make BDVE more easily compatible for use together with PFM in vapor-based plasma deposition. Ex. 1002 ¶215.

Accordingly, a POSA would have been motivated to use Francesch’s cross-linked PFM/BDVE copolymer coatings on electronic devices.

***Reasonable expectation of success.*** In addition, a POSA reasonably would have expected to succeed with the asserted combination based on teachings from Francesch and Legein. POSAs considered plasma polymerization routine by June 2015, and the ’087 patent itself stated that appropriate conditions for plasma deposition on electronics could be determined “using routine methods.” Ex. 1001, 15:4-5; Ex. 1002 ¶216. In addition, a POSA would have expected PFM and BDVE to successfully copolymerize and produce coatings through plasma polymerization on hard surfaces like those of an electronic device because Francesch expressly

disclosed doing just that on silicon-wafer substrates. Ex. 1002 ¶217; Ex. 1006 at 606-07. And a POSA also would have reasonably expected a PFM-based polymer coating protect such substrates against water damage because Legein taught that methacrylate monomers, including fluorinated methacrylate monomers, could produce protective, water-repellent coatings. Ex. 1005, 11:14-12:12, 16:7-27; Ex. 1002 ¶217-18. A POSA would also have expected the combined coating to be successful as applied to electronic devices because Legein described plasma polymerization as the preferred method for applying coatings to electronics, particularly methacrylate-based coatings, Francesch taught applying BDVE-crosslinked PFM coatings to solid silicon substrates, and the POSA would have known that the crosslinked combination could be applied to any solid surface. Ex. 1002 ¶¶216-17.

Accordingly, claim 1 would have been obvious over Francesch and Legein.

## **2. Claim 2**

As explained above, it would have been obvious to prepare the coated device of claim 1 in view of Francesch and Legein. Claim 2 specifies barrier properties of the coating in claim 1. That would have been an expected and routine result of the obvious combination of Francesch and Legein.

A POSA would have understood that a barrier to mass transport includes restricting passage of molecules, like water or oxygen, and that a barrier to electron transport restricts passage of electrons—in other words, an electrical insulator. Ex.

1002 ¶¶150; *see also* Ex. 1001, 3:10-19, 3:47. A POSA would have viewed those as desirable properties when preparing a protective coating for electronics. Ex. 1002 ¶178. A POSA also would have known that PFM is a fluorinated acrylate monomer and that polymer coatings had been prepared using fluorinated acrylates or fluorinated methacrylates yielding insulating and molecular barrier properties. Ex. 1002 ¶220. Furthermore, a POSA would have expected crosslinking to improve barrier properties of such coatings by reducing crystallinity and the associated likelihood of channels for molecules or electrical conductance through the coatings. *Id.*

A POSA therefore would have sought and expected coatings based on the asserted combinations to exhibit the claimed barrier properties. The '087 patent admits that producing those properties using the prior-art monomers and crosslinkers of claim 1 would have been within the skill of a POSA. Ex. 1001, 14:30-36. Similarly, the '087 patent indicates that a coating thickness of at least 50 nm typically suffices to provide a barrier coating, Ex. 1001, 3:13-15, and a POSA would have known that greater coating thickness facilitates barrier properties and would have known how to increase coating thickness simply by increasing plasma polymerization time. Ex. 1002 ¶¶181, 198, 221; Ex. 1005, 9:15-17, 28:23-25; Ex. 1006 at 608 (describing deposition rates). The barrier properties recited in claim 2 thus would have been expected and obvious for a POSA to achieve using PFM, BDVE, and plasma polymerization as described by Francesch.

### 3. Claim 3

As explained above, it would have been obvious to prepare the coated device of claim 1 in view of Francesch and Legein. Claim 3 specifies a surface WCA of at least 90° for the same coated device of claim 1. It would have been obvious to a POSA to prepare polymer coatings with that recited property in view of Francesch and Legein.

By 2015, WCA was a well-known measure of surface hydrophobicity, and POSAs understood that water-repellent surfaces exhibit WCA greater than 90°. Ex. 1002 ¶¶182-83; Ex. 1001, 4:27-29. A POSA would have known that polymers made using the fluorinated PFM monomers that would have been used were known to be hydrophobic and suitable for forming water-repellent coatings. Ex. 1002 ¶¶211, 222. And as acknowledged in the '087 patent, a skilled artisan using a hydrophobic monomer like PFM would have known how to adjust the ratio of monomer:crosslinker to achieve the desired level of liquid repellency. Ex. 1001, 14:26-36. The WCA recited in claim 3 thus would have been an obvious and expected property for a POSA to achieve with co-polymer coatings prepared according to Francesch and Legein.

### 4. Claim 4

A POSA seeking to increase water repellency in protective coatings resulting from the combination of Francesch and Legein would have been motivated to substitute the C<sub>4</sub>H<sub>8</sub> hydrocarbon chain in the BDVE linker moiety with a C<sub>4</sub>F<sub>8</sub>

fluorocarbon chain. Ex. 1002 ¶223. Fluorinated hydrocarbons were well known to exhibit strong hydrophobicity, and it was routine to substitute hydrocarbon groups with fluorocarbon groups in organic compounds like BDVE. Ex. 1002 ¶¶189, 223. A POSA would have expected that substitution to increase the hydrophobicity of resulting crosslinked polymer coatings, thus providing greater protection against water infiltration and damage to coated electronics.

Making that substitution in the linker moiety of BDVE would have resulted in a crosslinker matching the structural criteria for compound (i), formula B3 of claim 1. Like BDVE, the resulting fluoro-substituted crosslinker would contain two double bonds separated by a linker moiety and hydrogen at positions Y<sub>1</sub>-Y<sub>6</sub>. Ex. 1002 ¶224. In addition, the fluoro-substituted crosslinker would have fit formula B3 where each Y<sub>9</sub> is oxygen (—O—) and where Y<sub>10</sub> is a fluorocarbon chain in which each Y<sub>12</sub> and Y<sub>13</sub> are fluoro and *n* is four. Ex. 1001, 19:30-39, 20:1-11. That fluoro-substituted crosslinker structure also would have satisfied the additional limitation of claim 4, with the number (*n*) of fluorocarbon (CF<sub>2</sub>) groups in the linker moiety equal to four. Ex. 1002 ¶224. Accordingly, claim 4 would have been obvious to one of ordinary skill in the art in view of Francesch, Legein, and the level of skill in the art.

## 5. Claim 7

As explained above, BDVE is the crosslinker in the asserted combination of Francesch and Legein. Claim 7 lists BDVE as one of its specifically claimed crosslinkers. Ex. 1001, 20:46-48. Accordingly, claim 7 would have been obvious over Francesch and Legein for the same reasons as claim 1.

## 6. Claims 9 and 10

Petitioner submits that the language in claims 9 and 10 should be entitled to no patentable weight. Those claims purport to limit claim 1 such that “each X” recited in claim 1 is H (claim 9) or F (claim 10). Ex. 1001 20:57-60. But claim 1 expressly specifies that  $n_1$  can be zero, which means that no X group is required in the claims. Ex. 1001 18:62. Optional elements as in claims 9 and 10 “do not narrow the claim because they can always be omitted.” *In re Johnston*, 435 F.3d 1381, 1384 (Fed. Cir. 2006). Claims 9 and 10 thus would have been obvious over the same combination of Francesch and Legein asserted against claim 1.

Even if considered limiting, claim 9 would have been obvious to a POSA. As a POSA would have known, including a hydrocarbon ( $\text{CH}_2$ ) spacer of even  $n = 1$  between the acrylate group and the aryl group of PFM would have increased the flexibility of the monomer thus more readily allowing aryl groups in the resulting polymer to position at the surface of the polymer coating, further increasing hydrophobicity. Ex. 1002 ¶¶226-27. The POSA therefore would have been motivated to

add at least one CX<sub>2</sub> spacer to PFM to allow increased flexibility for the aryl group to be positioned at the surface of the finished polymer coating. That modified monomer would have been easy to make or obtain, so a POSA would have reasonably expect to succeed in doing so. Ex. 1002 ¶227. Accordingly, claim 9 would have been  
5 obvious for that additional reason.

### 7. Claims 11-14

Legein taught applying such protective polymer coatings to electronic devices including a mobile phone, a personal digital assistant, a keyboard, a loudspeaker, and MP3 player, and a tablet computer. Ex. 1005, 10:22-26; Ex. 1002 ¶¶229-30.

10 Claims 11-14 therefore would have been obvious for the same reasons as claim 1.

### VII. Statement regarding § 325(d)

The Board should not deny institution under § 325(d). The same or substantially the same art or arguments were not previously presented, and the examiner erred in allowing the challenged claims during prosecution.

15 Regarding the prior art, Cohen, Francesch, and Legein were submitted to the examiner during prosecution, but not until the examiner had already identified patentable subject matter in the application. Ex. 1028 at 141-42, 150-51 (September 2020 office action identifying allowable subject matter), *id.* at 196-98, 205-09 (October 2020 IDS citing Cohen, Francesch, and Legein). None of those references were  
20 ever used in a rejection or even mentioned by the examiner. Cohen, Francesch, and

Legein are asserted here to supply teachings and to support arguments that were wholly absent during prosecution—namely, that the prior art *expressly described* the structures and properties of various claimed crosslinkers that the examiner identified as supplying patentable subject matter in the issued claims, and the cited disclosures of those references would have made it obvious to use them for preparing crosslinked plasma-polymer coatings for electrical devices as claimed. *Oticon Med. AB v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 15-16 (PTAB Oct. 16, 2019) (precedential in pertinent part). Both Cohen and Francesch taught preparing such coatings using aryl acrylate monomers with crosslinking reagents covered by the '087 claims, as explained in Grounds 1 and 2. Similarly, Legein's cited teachings, including those about the advantages of plasma polymerization of acrylates, methacrylates, and organosilanes for protecting electrical components were not addressed during prosecution. The prior art asserted here is thus materially different and not cumulative with that considered during prosecution.

Furthermore, there was error during prosecution. The issued claims received little substantive evaluation even as to the limited prior art that was cited by the examiner. The examiner effectively issued a first-action allowance regarding the issued claims, stating that selected dependent claims were allowable if re-written in independent form because the cited references did not teach or suggest the specifically recited crosslinkers. Ex. 1028 at 150-51. But as demonstrated here, the prior

art contained numerous references describing those very crosslinkers and their use with acrylate monomers, including those containing aryl groups, in polymer-coating applications. The examiner “was simply not aware” of those teachings. *Oticon*, IPR2019-00975, Paper 15 at 19-20. That was substantial error.

5           In view of the substantially different art and arguments presented here, and the errors during prosecution of the '087 patent, § 325(d) does not apply.

### **VIII. Statement regarding discretionary denial**

          The Board should not deny institution based on the pendency of parallel proceedings under *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 10 2020) (precedential). The patent owner has accused petitioner of infringing the '087 patent in an ongoing district-court case. *P2i, Ltd. v. Favored Tech USA Corp.*, No. 3:23-cv-01690 (N.D. Cal.). That matter is nowhere near trial. Petitioner filed motions to dismiss the operative complaint in July 2023, and those motions remain pending and are scheduled for oral argument on January 4, 2024. Notice Continuing 15 Motions Hearing, *P2i, Ltd. v. Favored Tech USA Corp.*, No. 3:23-cv-01690 (N.D. Cal. Sept. 6, 2023), ECF No. 53. No trial date has been set—indeed, at this point no answer has even been filed, and one may never be filed if petitioner prevails on its pending dispositive motions. As such, the parties have made minimal investments in that case to date, with only limited discovery and no claim construction. The liti- 20 gation also only partially overlaps with the issues in this petition, as the litigation

involves another asserted patent in addition to the '087 patent challenged here. Amended Complaint, *P2i, Ltd. v. Favored Tech USA Corp.*, No. 3:23-cv-01690 (N.D. Cal. July 5, 2023), ECF No. 38.

Furthermore, Petitioner hereby stipulates that if the Board institutes IPR, it  
5 will not pursue in district court the specific grounds asserted in this petition or any other ground of anticipation or obviousness ground based on prior-art patents or printed publications that reasonably could have been raised in an IPR. *See Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18-19 (PTAB Dec. 1, 2020) (precedential in pertinent part). This stipulation is not intended to limit peti-  
10 tioner's ability to assert invalidity on any other ground (i.e., grounds including invalidity under 35 U.S.C. §§ 101 and 112 or based on other categories of prior art not eligible for consideration via IPR).

## **IX. Mandatory notices**

In compliance with 37 C.F.R. § 42.8(b), Petitioner submits the following man-  
15 datory notices.

### **A. Real party-in-interest**

The real parties-in-interest are Jiangsu Favored Nanotechnology Co., Ltd. and Favored Tech USA Corp.

**B. Related matters**

Petitioner identifies the following related matter: *P2i, Ltd. v. Favored Tech USA Corp.*, No. 3:23-cv-01690 (N.D. Cal.).

**C. Counsel and service information**

5 Petitioner appoints the following lead and back-up counsel:

| Lead Counsel                                                                                                                                                                                                        | Back-Up Counsel                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Patrick McKeever<br/>Reg. No. 66,019</p> <p>PERKINS COIE LLP<br/>11452 EL Camino Real, Suite 3000<br/>San Diego, CA 92130<br/>tel: 858.720.5700<br/>fax: 858.720.5799<br/>mckeever-ptab@perkinscoie.com</p>      | <p>Han-Wei Chen<br/>Reg. No. 75,350</p> <p>PERKINS COIE LLP<br/>3150 Porter Drive<br/>Palo Alto, CA 94304<br/>tel: 650.838.4300<br/>fax: 650.838.4350<br/>chen-ptab@perkinscoie.com</p>                             |
| Back-Up Counsel                                                                                                                                                                                                     | Back-Up Counsel                                                                                                                                                                                                     |
| <p>Andrew T. Dufresne, Ph.D.<br/>Reg. No. 66,636</p> <p>PERKINS COIE LLP<br/>33 East Main Street, Suite 201<br/>Madison, WI 53703<br/>tel: 608.663.7460<br/>fax: 608.663.7499<br/>dufresne-ptab@perkinscoie.com</p> | <p>Allison M. Glasunow, Ph.D.<br/>Reg. No. 72,737</p> <p>PERKINS COIE LLP<br/>1201 Third Avenue, Suite 4900<br/>Seattle, WA 98101<br/>tel: 206.359.3199<br/>fax: 206.332.7198<br/>glasunow-ptab@perkinscoie.com</p> |

Counsel can be reached using the contact information provided above, and Petitioner consents to electronic service at the indicated e-mail addresses. Petitioner has executed and is filing a corresponding power of attorney.

**X. Requirements for *inter partes* review**

This petition complies with all requirements, including 37 C.F.R. §§ 42.104, 42.105, and 42.15, and should be accorded a filing date under 37 C.F.R. § 42.106. Petitioner authorizes the Director to charge any required fees to Deposit Account  
5 50-0665, charge number 127908.0006.

**A. Grounds for standing**

Petitioner certifies under § 42.104(a) that the '087 patent is available for IPR and that Favored is not barred or estopped from challenging it. Favored meets all requirements under 35 U.S.C. §§ 315(a)(1), 315(b), and 315(e)(1), and 37 C.F.R.  
10 §§ 42.73(d)(1), 42.101, and 42.102.

**B. Identification of challenge**

Under 37 C.F.R. §§ 42.104(b) and 42.22, Petitioner requests cancelation of claims 1-5, 7, and 9-14 on the following grounds under § 103:

| Ground   | Claims          | Basis for Unpatentability         |
|----------|-----------------|-----------------------------------|
| Ground 1 | 1-3, 5, 7, 9-14 | Obvious over Cohen and Legein     |
| Ground 2 | 1-4, 7, 9-14    | Obvious over Francesch and Legein |

The Cohen reference cited in Ground 1 described polymers that could be used  
15 to insulate various electrical devices and components prepared using a crosslinker and a monomer covered by the '087 claims. Specifically, Cohen described copolymerizing a covered crosslinker known as divinyl tetramethyldisiloxane (DVTMDS)

with acrylate monomers, including the covered aryl acrylate monomers benzyl acrylate and benzyl methacrylate.

The Francesch reference cited in Ground 2 described coating silicon wafers with polymers prepared with another aryl acrylate monomer covered by the '087  
5 claims—pentafluorophenyl methacrylate (PFM)—and another covered crosslinker known as 1,4-butanediol divinyl ether (BDVE).

Both grounds further include the Legein reference, which focused specifically on using plasma polymerization to apply protective polymer coatings to electrical components and devices. Petitioner also relies on the declaration of Dr. Karen  
10 Gleason (Ex. 1002) and other references in the exhibit list.

## **XI. Conclusion**

Petitioner respectfully requests institution and cancelation of the challenged claims.

Respectfully submitted,

Dated: January 3, 2024

/Patrick McKeever/

Lead Counsel

Patrick McKeever., Reg. No. 66,019

Back-Up Counsel

Han-Wei Chen, Reg. No. 75,350

Back-Up Counsel

Andrew T. Dufresne, Reg. No. 66,636

Back-Up Counsel

Allison M. Glasunow, Reg. No. 72,737

PERKINS COIE LLP  
33 East Main Street, Suite 201  
Madison, Wisconsin 53703  
(608) 663-7492 (phone)  
(608) 663-7499 (fax)

*Counsel for Petitioner*

*Favored Tech Corporation*

**CERTIFICATE OF WORD COUNT UNDER 37 CFR § 42.24(d)**

Under 37 C.F.R. § 42.24(d), the undersigned certifies that this petition for *inter partes* review totals 13,111 words, excluding the parts exempted by 37 C.F.R. § 42.24(a). The word count was made using the built-in word count function in the Microsoft® Word software used to prepare this document.

Dated: January 3, 2024

Respectfully submitted,

/Patrick McKeever/

Lead Counsel

Patrick McKeever., Reg. No. 66,019

Back-Up Counsel

Han-Wei Chen, Reg. No. 75,350

Back-Up Counsel

Andrew T. Dufresne, Reg. No. 66,636

Back-Up Counsel

Allison M. Glasunow, Reg. No. 72,737

PERKINS COIE LLP  
33 East Main Street, Suite 201  
Madison, Wisconsin 53703  
(608) 663-7492 (phone)  
(608) 663-7499 (fax)

*Counsel for Petitioner  
Favored Tech Corporation*

## CERTIFICATE OF SERVICE

The undersigned hereby certifies that true copies of this petition for *inter partes* review of U.S. Patent 11,041,087 and supporting materials (power of attorney and Exhibits 1001-1058) have been served in their entireties on the patent owner by Federal Express at the correspondence address of record for the '087 patent shown in the Office's Public Patent Center system:

Kagan Binder, PLLC  
Suite 200, Maple Island Building  
221 Main Street North  
Stillwater, Minnesota 55082

Service was also made on counsel for patent owner via e-mail:

andrew@bochner.law  
ariel@bochner.law

Dated: January 3, 2024

Respectfully submitted,

PERKINS COIE LLP  
33 East Main Street, Suite 201  
Madison, Wisconsin 53703  
(608) 663-7492 (phone)  
(608) 663-7499 (fax)

/Patrick McKeever/

Lead Counsel  
Patrick McKeever., Reg. No. 66,019

Back-Up Counsel  
Han-Wei Chen, Reg. No. 75,350

Back-Up Counsel  
Andrew T. Dufresne, Reg. No. 66,636

Back-Up Counsel  
Allison M. Glasunow, Reg. No. 72,737

*Counsel for Petitioner  
Favored Tech Corporation*