

Jiangsu Favored Nanotechnology Co. Ltd.
v.
P2i Ltd.

IPR2024-00380 – U.S. Patent No. 11,041,087

Petitioner's Demonstratives

Oral Argument
March 26, 2025

'087 Patent – Claim 1

1. An electronic or electrical device or electronic or electrical component thereof comprising a protective cross-linked polymeric coating on a surface of the device or component;

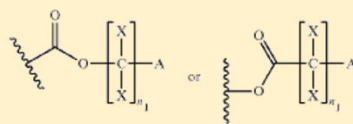
wherein the protective cross-linked polymeric coating is obtained by exposing the device or component to a plasma comprising a monomer compound and a cross-linking reagent for a period of time sufficient to allow formation of the protective cross-linked polymeric coating on a surface thereof,

monomer limitation

wherein the monomer compound has the following formula:



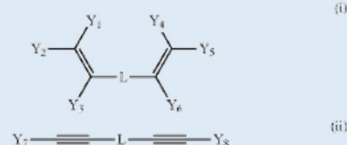
where R_1 , R_2 and R_4 are each independently selected from hydrogen, optionally substituted branched or straight chain C_1 - C_6 alkyl or halo alkyl or aryl optionally substituted by halo, and R_3 is selected from:



where each X is independently selected from hydrogen, a halogen, optionally substituted branched or straight chain C_1 - C_6 alkyl, halo alkyl or aryl optionally substituted by halo; where A is aryl optionally substituted by halo; and n_1 is an integer from 0 to 27; and wherein the

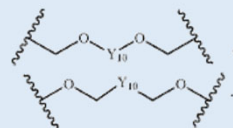
crosslinker limitation

halo; and n_1 is an integer from 0 to 27; 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:



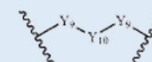
where Y_1 , Y_2 , Y_3 , Y_4 , Y_5 , Y_6 , Y_7 and Y_8 are each independently selected from hydrogen, optionally substituted cyclic, branched or straight chain C_1 - C_6 alkyl or aryl; and L is a linker moiety;

wherein for compound (i) L is of formula A having one of the following structures:

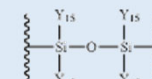


and Y_{10} is selected from optionally substituted cyclic, branched or straight chain C_1 - C_8 alkylene and a siloxane group;

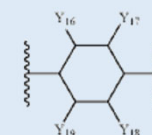
or wherein for compound (i) L is of formula B having the following formula:



where each Y_9 is independently selected from, a bond, $-\text{O}-$, $-\text{O}-\text{C}(\text{O})-$, $-\text{C}(\text{O})-\text{O}-$, $-\text{Y}_{11}-\text{O}-\text{C}(\text{O})-$, $-\text{C}(\text{O})-\text{O}-\text{Y}_{11}-$, $-\text{OY}_{11}-$, and $\text{Y}_{11}\text{O}-$, where Y_{11} is an optionally substituted cyclic, branched or straight chain C_1 - C_8 alkylene; and 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 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 wherein Y_{10} has the following formula:



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

Invalidity Grounds

1. Cohen + Legein
2. Francesch + Legein

Disputed Issues

- Analogous Art
 - Cohen (Ground 1)
 - Francesch (Ground 2)
- Motivation to Combine
 - Cohen + Legein (Ground 1)
 - Francesch + Legein (Ground 2)

Analogous Art

'087 Patent's Field of Endeavor: Protective Coatings / Polymer Coatings

(54) **COATINGS**

(71) Applicant: **P2i Ltd**, Abingdon (GB)

(72) Inventors: **Stephen Richard Coulson**, Abingdon (GB); **Delwyn Evans**, Abingdon (GB); **Angeliki Siokou**, Abingdon (GB); **Clive Telford**, Abingdon (GB)

FIELD OF THE INVENTION

This invention relates to protective coatings. Specifically, the present invention relates to protective coatings for electronic or electrical devices and components thereof, and methods of forming such coatings. The coatings can protect by being hydrophobic and so resist the ingress of water-based liquid into electronic devices, or they can protect by forming a barrier coating and so provide electrical resistance between the electrical parts of the phone and water based liquid.

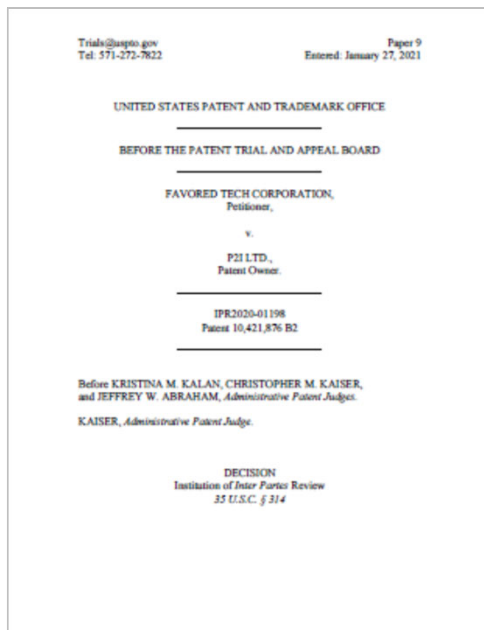
Ex. 1001 at 1: 12-22.

Although the invention is of benefit in the context of a wide variety of substrates, the substrate may, in all aspects of the invention, advantageously be an electronic substrate.

Ex. 1001 at 14:38-40.

'087 Patent's Field of Endeavor: Protective Coatings / Polymer Coatings

- Board refused to limit field of endeavor to “electronic devices” in IPR dealing with parent patent.



at 4:4–29. Arguably, Badyal falls outside Patent Owner’s narrower proposed field because it does not teach coating “electronic devices” with its method. We are not persuaded, however, that the field of endeavor of the ’876 patent can be limited to solely “electronic devices.” The claims of the ’876 patent extend beyond electronic devices, also encompassing “electrical device[s],” as well as “electronic or electrical components” of devices. Ex. 1001, 18:26–29. Moreover, the specification of the ’876 patent expressly refuses to limit the substrates that may be coated to “electronic substrate[s],” stating instead that “the invention is of benefit in the context of a wide variety of substrates.” *Id.* at 14:30–32. Finally, the ’876 patent states that its field is “protective coatings for electronic or electrical devices and components thereof.” *Id.* at 1:5–8. Accordingly, at least on the present record, we determine that Badyal falls within the same field of endeavor as the ’876 patent.

Favored Tech Corp. v. P2i Ltd.,
IPR2020-01198,
Paper 9 at 19 (Jan. 27, 2021).

Francesch is analogous art even under PO's overly narrow field of endeavor

- '087 patent discloses coating silicon wafers
- Francesch also discloses coating silicon wafers

EXAMPLE 1

Example of Plasma Polymerising PFAC6 with No Cross-linker in a 3 Litre Chamber

PFAC6 was polymerised in a 3 litre glass chamber using a continuous plasma process. In the experimental matrix, the continuous plasma was produced using RF power levels of 50, 100 and 200 Watts. The process pressure was run at 30, 60 and 90 mTorr and the monomer flow rate run at 50, 100 and 200 microlitres of liquid per minute. The duration of the process was either 10 or 40 minutes. The coated substrate was silicon wafer and whether the coating was tacky or not was determined by wiping the substrate with a finger and determining by eye if the coating had smeared. The results

Ex. 1001 at 15:44-64.

The gases or monomers were supplied via a standard manifold with gas fluxes adjusted with needle valves. The system pressure was determined using a Pirani type vacuum meter (MKS, USA), positioned between the reactor and a cold trap. The two stage mechanical pump (RV12 903, Edwards, GB), positioned after the cold trap, evacuated the vessel to a reactor chamber pressure of 0.1 mbar. All polymers were deposited on 100 oriented silicon wafers. All polymerizations were performed under pulsed plasma. The pulsed RF power setting was 10 W, with a duty cycle of 50% with a frequency of 15 Hz. Deposition times ranged from 2 to 8 h. PFM was used as synthesized. The monomer was preheated to reach the desired polymerization pressure. The monomer flow rate was set so that the pressure within the reactor was 0.3 mbar. PFM was also copolymerized with 1,7-octadiene (liquid, boiling point: 115.5 °C at 760 mmHg) and with 1,4-butanediol divinyl ether (liquid, boiling point 95 °C at 20 mmHg) as crosslinkers. Crosslinker/PFM ratios used were 3:1 and 6:1 for octadiene/ PFM and 3:1 and 4:1 for divinyl ether/ PFM.

Ex. 1006 at 607.

Cohen and Francesch are at least reasonably pertinent

- Cohen

- Disclosed crosslinker (DVTMDS) for co-polymerizing with variety of monomers.
- Applications included “dielectric materials in electrical apparatus” and “numerous other electrical applications.”

See Pet. Reply at 7.

- Francesch

- Disclosed co-polymerizing monomer (PFM) and crosslinking reagent (BDVE).
- Polymer coatings deposited using pulsed plasma polymerization.
- Described coating silicon wafers.

See Pet. Reply at 7-8.

PO uses same narrow framing for both tests

-
2. The Field of Endeavor of the '087 Patent is Plasma Polymerized Protective Coatings For Electronic Devices
-

POR at 18

-
3. The Problems Faced By The Inventors of the '087 Patent are Specific to Plasma Polymerized Protective Coatings for Electronic Devices
-

POR at 19

Cohen is also not reasonably pertinent to the problem faced by the inventors of the '087 Patent—creating improved plasma polymerized protective coatings for electronic devices.

POR at 20-21

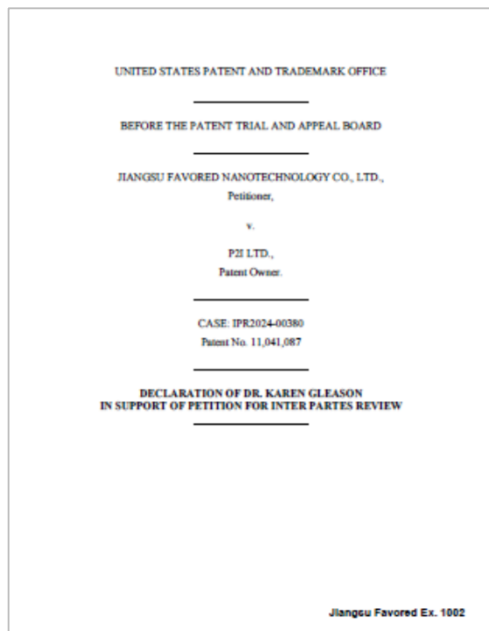
PO uses same narrow framing for both tests

“The problems to which the claimed invention and reference at issue relate must be identified and compared from the perspective of a person having ordinary skill in the art (‘PHOSITA’). *See, e.g., Sci. Plastic Prods., Inc. v. Biotage AB*, 766 F.3d 1355, 1360 (Fed. Cir. 2014) (‘The analogous art inquiry is a factual one, requiring inquiry into the similarities of the problems and the closeness of the subject matter as viewed by a person of ordinary skill.’). Importantly, this analysis must be carried out from the vantage point of a PHOSITA who is considering turning to the teachings of references outside her field of endeavor. *See Clay*, 966 F.2d at 660 (concluding that a reference was not reasonably pertinent where a PHOSITA ‘would not reasonably have expected to solve the [relevant] problem ... by considering’ that reference). Such a PHOSITA—resigned to considering art outside her field of endeavor—would thus not identify the problems so narrowly so as to rule out all such art. The Board’s characterization of the problem to which the claimed invention relates effectively collapses the field-of-endeavor and reasonable-pertinence inquiries and ignores that the reasonable-pertinence analysis must be carried out through the lens of a PHOSITA who is considering turning to art outside her field of endeavor.”

Donner Tech., LLC v. Pro Stage Gear, LLC, 979 F.3d 1353, 1360 (Fed. Cir. 2020).

Motivation to Combine / Level of Ordinary Skill

PO doesn't rebut Petitioner's evidence in support of motivation to combine



- Dr. Gleason provided substantial evidence (including corroborating documentary evidence) in support of motivation to combine for both grounds.
 - Ground 1: Cohen + Legein
 - See Pet. at 31-37; Ex. 1002 (Gleason) at ¶¶ 161-177.
 - Ground 2: Francesch + Legein
 - See Pet. at 52-55; Ex. 1002 (Gleason) at ¶¶ 208-219.
- PO ignores virtually all of Petitioner's evidence addressing motivation to combine.

PO's expert's testimony was conclusory

- E.g., pulsed plasma was beyond the skill of a POSA:

103. Additionally, this pulsed plasma polymerization technique is well outside the field of the relevant POSITA (which, per Dr. Gleason, would have only a bachelor's degree in chemistry, chemical engineering, or related field; Ex. 1002 ¶ 29). Instead, the pulsed plasma polymerization technique encompassed by the claims of the '087 Patent could, at best, only be accomplished by highly sophisticated physicists and engineers with far more training and/or experience.

Ex. 2007 at ¶ 103.

[illegible]

See Ex. 1001 at 1:26-28 (citing Ex. 1022 as background).

JOURNAL OF POLYMER SCIENCE: Polymer Chemistry Edition

VOL. 15, 91-97 (1977)

**Some Aspects of Plasma Polymerization Investigated
by Pulsed R.F. Discharge**

H. YASUDA and T. HSU, *Research Triangle Institute, Research Triangle
Park, North Carolina 27709*

INTRODUCTION

The polymerization of an organic compound in plasma (glow-discharge polymerization) is quite different from the conventional chemically initiated polymerizations or radiation-initiated polymerization. For instance, polymerization of styrene in plasma and those by other means of initiation can be distinguished in the following manner. In conventional polymerizations, including radiation-induced polymerizations which utilize relatively low dose rates of gamma-rays, various means of initiation are used to produce various kinds of reactive species, but the propagation step of the styrene polymerization is essentially the addition reaction of those reactive species to the vinyl double bond of styrene. Therefore, the reactivity of the vinyl double bond toward the reactive species created in the initiation step is an important factor which influences the overall polymerization rate. A typical example may be seen in polymerization rate of styrene and *n*-methylstyrene in free-radical-initiated polymerization. In any case, however, the presence of vinyl double bond is necessary for all conventional (radiation-induced) polymerizations, and the absence of the vinyl double bond (i.e., ethylbenzene) means no polymerization.

In the case of the plasma polymerization, ethylbenzene not only polymerizes,

81

© 1977 by John Wiley & Sons, Inc.

Ex. 1061 (Yasuda, 1977).

According to PO and its expert, a POSA ...



- Wouldn't know difference between pulsed and continuous plasma polymerization (POR at 25-26; Ex. 2007 at ¶ 102)
- Wouldn't know how to optimize parameters to achieve claimed coating (POR at 25-26; Ex. 2007 at ¶ 102)
- Wouldn't be able to use pulsed plasma polymerization technique disclosed by Legein (POR at 11; Ex. 2007 at ¶ 113)
- Wouldn't know how to modify Francesch's reaction conditions (POR at 37; Ex. 2007 at ¶ 119)
- Would be "overwhelmed by the numerous parameters not listed in Legein" (POR at 37; Ex. 2007 at ¶ 122)

Agreed Level of Ordinary Skill

- Petitioner: “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.” Pet. at 20 (citing Ex. 1002 at ¶¶ 22-29).
- PO: “For purposes of this proceeding, Patent Owner does not dispute this characterization of the level of ordinary skill in the art.” POR at 13.

'087 Patent – POSA can determine “precise conditions ... using routine methods”

In all aspects of the invention, the precise conditions under which the protective polymeric coating is formed in an effective manner will vary depending upon factors such as, without limitation, the nature of the monomer compound, the crosslinking reagent, the substrate, as well as the desired properties of the coating. These conditions can be determined using routine methods or, preferably, using the techniques and preferred features of the invention described herein, which work in particular synergy with the invention.

Ex. 1001 at 14:66 - 15:7.

'087 Patent – No discussion of any conditions for use with claimed aryl monomer

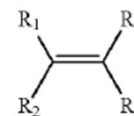
In all aspects of the invention, the precise conditions under which the protective polymeric coating is formed in an effective manner will vary depending upon factors such as, without limitation, the nature of the monomer compound, the crosslinking reagent, the substrate, as well as the desired properties of the coating. These conditions can be determined using routine methods or, preferably, using the techniques and preferred features of the invention described herein, which work in particular synergy with the invention.

Ex. 1001 at 14:66 - 15:7.

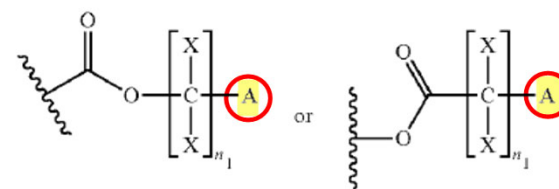
See Ex. 1059 (Gleason Reply Decl) at ¶ 16.

See also Ex. 1060 (Senkevich Dep. Tr.) at 151:9-156:14.

wherein the monomer compound has the following formula:



where R_1 , R_2 and R_4 are each independently selected from hydrogen, optionally substituted branched or straight chain C_1 - C_6 alkyl or halo alkyl or aryl optionally substituted by halo, and R_3 is selected from:



where each X is independently selected from hydrogen, a halogen, optionally substituted branched or straight chain C_1 - C_6 alkyl, halo alkyl or aryl optionally substituted by halo; where A is aryl optionally substituted by halo; and n_1 is an integer from 0 to 27; and wherein the

Dr. Senkevich's conclusory testimony contradicts intrinsic evidence

- See, e.g., *General Electric Co. v. United Tech. Corp.*, IPR2016-01289, Paper 34 at 34 (Aug. 31, 2020):

Finally, and perhaps most significantly, compelling intrinsic evidence refutes Dr. Clarke's opinion that the presence of titanium, in the TiMoSi₂ alloy that comprises Terentieva's protective coating, introduces a host of variables that would have stymied an ordinarily skilled artisan. Ex. 2013 ¶¶ 16–18. The '360 patent expressly contemplates, and claims, the presence of titanium in the alloy comprising the bond layer, without any mention of those variables. Ex. 1001, 1:51–58; see *id.* at 2:63–3:5 (claims 2 and 3, which depend from claim 1). The written description does not hint at any need to account for the myriad variables, which Dr. Clarke testifies would have made impossible a determination of the compatibility of a TiMoSi₂ alloy with a BSAS layer. Ex. 2013 ¶ 18; see Ex. 1001, Abstract, 1:51–60, 2:27–43, 2:63–3:5. It stands to reason that this task was not impossible at the time of the invention, but could be left to the general knowledge and ordinary skill of an artisan in the field.

PO attempts to read limitations into Claim 1

- ❌ “pulsed” plasma
- ❌ “optimized parameters”
- ❌ “barrier” coating

PO attacks strawman motivation for Ground 1

- Petition asserted that POSA would have known Cohen's co-polymers would have been hydrophobic and had barrier properties based on chemical makeup.
 - See Pet. at 31, 37-39; Ex. 1002 (Gleason) at ¶¶ 164, 170, 177-181; *see also* Ex. 1054 at ¶ 4; Ex. 1056 at 4:24-6:3.
- PO doesn't address / dispute the above evidence. See POR at 26.
 - PO argues Cohen doesn't describe compounds as hydrophobic or barrier. POR at 26.

PO attacks strawman motivation for Ground 2

- Petition asserted that POSA would have known the benefits of crosslinking (e.g., improved strength, durability, solvent resistance).
 - See Pet. at 19; Ex. 1002 (Gleason) at ¶¶ 209; 50-54 (discussing crosslinking).
- PO doesn't address / dispute the above evidence. See POR at 35.
 - Although PO concedes Francesch discloses a crosslinking reagent, Francesch does not credit crosslinking for improved barrier properties. POR at 35.

Dr. Gleason explained timing of Limb paper:

A. So when Scott started his research, he did the pulsed plasma method. And we were trying to get films that had as high a content of CF₂ groups as possible. And with the pulsed plasma method we were able to get to a certain level but we wanted to get higher. And he modified the reactor so that he put in a film wire and didn't use the plasma. And we, indeed, achieved films that were a hundred percent CF₂.

Ex. 2016 at 38:2-25.

It was kind of a eureka moment for my lab and informed all of the rest of the papers that I did in my lab and also the founding of the company that I had. So, really, the pulsed plasma work was in some sense put aside by Scott and he, you know, did work on this pyrolytic CVD. And then for his thesis which, as I mentioned, my recommendation was there were four technical chapters, that was sort of our standard minimum, he went back to the pulsed plasma data that they had collected and developed a model for. And the model was very important for him to pass scrutiny with the thesis committee which included chemical engineering faculty who were experts in chemical engineering but not necessarily in plasmas.

24