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Paper 26
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

REACTIVE SURFACES LTD., LLP,
Petitioner,

v.

TOYOTA MOTOR CORPORATION,
Patent Owner.

Case IPR2016-01914
Patent 8,394,618 B2

Before CHRISTOPHER M. KAISER, JEFFREY W. ABRAHAM, and MICHELLE N. ANKENBRAND, *Administrative Patent Judges.*

KAISER, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

INTRODUCTION

A. Background

Reactive Surfaces Ltd., LLP ("Petitioner") filed a Petition (Paper 1, "Pet.") requesting *inter partes* review of claims 1–11 of U.S. Patent No. 8,394,618 B2 (Ex. 1001, "the '618 patent"). The Patent Owner did not file a Preliminary Response.

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

After considering the Petition and the evidence currently of record, we determine that Petitioner has demonstrated that there is a reasonable likelihood that it would prevail with respect to at least one of the claims challenged in the Petition. Accordingly, we institute *inter partes* review.

B. Related Matters

The parties have not identified any judicial or administrative matters that involve the '618 patent or that are otherwise related to this case.[1] Pet. 1; Paper 4, 1.

[1] The parties note that the '618 patent was the subject of *Reactive Surfaces Ltd. LLP v. Toyota Motor Engineering & Manufacturing North America, Inc.*, Case No. 1-13-CV-1098-LY (W.D. Tex.), and *Reactive Surfaces Ltd. LLP v. Toyota Motor Corporation*, Case No. 1:14-CV-1009-LY (W.D. Tex.), both of which have been dismissed without prejudice. Pet. 1–2; Paper 4, 1.

C. The Asserted Grounds of Unpatentability

Petitioner contends that claims 1–11 of the '618 patent are unpatentable based on the following grounds (Pet. 32, 35–63):[2]

Statutory Ground	Basis	Challenged Claim(s)
§ 103	Van Antwerp[3]	1–3
§ 103	Van Antwerp and Bostek[4]	4 and 5
§ 103	Van Antwerp and Moon[5]	6–9
§ 103	Van Antwerp and Hamade[6]	10 and 11
§ 103	Schneider[7]	1–8, 10, and 11
§ 103	Schneider and McDaniel[8]	9
§ 103	Drevon[9]	1–9
§ 103	Drevon and Schneider	10 and 11

[2] Petitioner also relies on a declaration from Dr. David Rozzell. Ex. 1010.

[3] Van Antwerp, U.S. Patent No. 5,868,720, issued Feb. 9, 1999 (Ex. 1005, "Van Antwerp").

[4] C. Carl Bostek, *Effective Methods of In-Line Intravenous Fluid Warming at Low to Moderate Infusion Rates*, 60 J. AM. ASS'N NURSE ANESTHETISTS 561, 561–66 (Dec. 1992) (Ex. 1009, "Bostek").

[5] Moon et al., US 2005/0176905 A1, published Aug. 11, 2005 (Ex. 1006, "Moon").

[6] Hamade et al., U.S. Patent No. 6,150,146, issued Nov. 21, 2000 (Ex. 1007, "Hamade").

[7] Schneider et al., US 2005/0147579 A1, published July 7, 2005 (Ex. 1004, "Schneider").

[8] McDaniel, US 2004/0109853 A1, published June 10, 2004 (Ex. 1008, "McDaniel").

[9] Géraldine F. Drevon, Enzyme Immobilization into Polymers and Coatings (Ph.D. Thesis, University of Pittsburgh, Nov. 2002) (Ex. 1003, "Drevon").

D. The '618 Patent

The '618 patent is directed to a "substrate or coating . . . that includes a lipase with enzymatic activity toward a component of a fingerprint" and "a process for facilitating the removal of fingerprints . . . wherein an inventive substrate or coating including a lipase is capable of enzymatically degrading . . . one or more components of the fingerprint to facilitate fingerprint removal from the substrate or said coating." Ex. 1001, at [57]. "Fingerprint" is defined in the '618 patent as "a bioorganic stain, mark, or residue left behind after an organism touches a substrate or coating," and it "is not limited to marks or residue left behind after a substrate is touched by a finger." *Id.* at 3:1–4. "Other sources of bioorganic stains are illustratively, palms, toes, feet, face, any other skin surface area, hair, stains from fats used in cooking such as cis-fatty acids, or fatty acids from any other source." *Id.* at 3:4–8.

E. Illustrative Claims

All the claims of the '618 patent are challenged. Claim 1 is independent and illustrative; it recites:

> 1. A method of facilitating the removal of a fingerprint on a substrate or a coating comprising:
>
> providing a substrate or a coating;
>
> associating a lipase with said substrate or said coating such that said lipase is capable of enzymatically degrading a component of a fingerprint, and
>
> facilitating the removal of a fingerprint by vaporization from the lipase associated substrate or coating when contacted by a fingerprint.

Id. at 15:18–27.

ANALYSIS

A. Claim Construction

In an *inter partes* review, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144 (2016) (upholding the use of the broadest reasonable interpretation standard). Claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioner proposes construing "facilitating the removal of a fingerprint by vaporization," a term that appears in claim 1, as "enabling a bioorganic material deposited by an organism through touching a lipase associated substrate or coating to transition from an initial quantity of visually apparent bioorganic material being on such substrate or coating to a lesser quantity of visually apparent bioorganic material being thereon." Pet. 22 (citing Pet. 8–22). This proposed construction generally is supported by the Specification of the '618 patent. Ex. 1001, 3:1–9 (defining "fingerprint" as not limited to marks left by touching a surface with a finger, but also including other "bioorganic stains"). It does, however, expand the scope of the phrase beyond removal of fingerprints "by vaporization" to include removal by any and all means. Petitioner explains its deletion of the limitation "by vaporization" from its proposed construction by arguing that "'removal of a fingerprint by vaporization' does not find antecedent basis" earlier in claim 1. Pet. 21–22. According to Petitioner, because of this lack

of antecedent basis, the "removal of a fingerprint by vaporization" is not "necessarily . . . dependent on enzymatic degradation of a component of a fingerprint." *Id.* at 22. This does not explain why a person of ordinary skill in the art would understand "facilitating the removal of a fingerprint by vaporization" to include enabling the reduction of the amount of bioorganic material by any and all means. Accordingly, we do not adopt Petitioner's proposed construction to the extent that it extends the permissible means of fingerprint removal beyond vaporization. For purposes of the present decision, and based on the current record, we construe "facilitating the removal of a fingerprint by vaporization" as "enabling a bioorganic material deposited by an organism through touching a surface to transition, by vaporization of the bioorganic material, from an initial quantity of visually apparent bioorganic material being on such substrate or coating to a lesser quantity of visually apparent bioorganic material being thereon."

B. Asserted Obviousness over Van Antwerp

Petitioner argues that the subject matter of claims 1–3 would have been obvious to a person of ordinary skill in the art given the teachings of Van Antwerp. Pet. 32, 35–39.

1. Van Antwerp

Van Antwerp relates to "[a]n improved indwelling catheter adapted for long-term usage [that] includes a stable enzyme coating to prevent occlusion of the catheter lumen." Ex. 1005, at [57]. The catheter of Van Antwerp "includes a stable and substantially immobilized enzyme coating to prevent formation of and/or to dissolve occlusions along the catheter lumen," and the enzyme is disclosed as "fibrinolytic and/or lipolytic." *Id.* at 2:34–40. The catheter itself "is commonly constructed

from a polymeric material, such as medical grade silicone rubber, polyethylene, or the like." *Id.* at 3:65–67. The lipolytic enzyme of the catheter coating "combines with grease or soap-like phospholipids produced in the presence of body fluids and certain medications, to produce soluble lipase compounds," which causes the occlusion to be dissolved. *Id.* at 6:14–24.

2. Analysis

Petitioner argues that all limitations of claims 1–3 are taught or suggested by Van Antwerp. Pet. 36–39.

a. Claim 1

There is sufficient evidence, on the present record and for present purposes, that Van Antwerp teaches or suggests "providing a substrate or a coating" and "associating a lipase with said substrate or said coating such that said lipase is capable of enzymatically degrading a component of a fingerprint." Pet. 36–37 (citing Ex. 1005, 2:34–42, 3:41–44, 3:65–67, 4:8–26, 6:14–18, Fig. 4).

It is a closer case whether Van Antwerp teaches or suggests "facilitating the removal of a fingerprint by vaporization from the lipase associated substrate or coating when contacted by a fingerprint." Van Antwerp does not disclose the evaporation of bioorganic stains, because the enzyme coating of Van Antwerp is designed for "long-term interaction with body fluids to prevent and/or dissolve clots and occlusions within the catheter lumen." Ex. 1005, 1:16–20. Petitioner relies on the disclosure of the '618 patent and the testimony of Dr. Rozzell to show that lipase facilitates the vaporization of fingerprints inherently when the fingerprints are "in an environment that would support such vaporization," such as "an

ambient environment consisting of air." Pet. 37–38 (citing Pet. 13–15; Ex. 1010 ¶¶ 35–41, 94–96). The '618 patent does not support a finding that it would have been known by a person of ordinary skill in the art either that fingerprints contain low-volatility lipids or that fingerprint lipids could be broken into smaller, higher-volatility molecules by contact with a lipase, because the disclosure cited refers to the inventors' discovery of these facts, not the general knowledge in the art. Ex. 1001, 2:34–56. Dr. Rozzell's testimony, however, does suggest that a person of ordinary skill in the art would have known (1) that fingerprints contain compounds of different volatilities, (2) that the presence of more high-volatility compounds would increase the rate at which fingerprints vaporize, and (3) that lipase could catalyze degradation of lipids in fingerprints to break those lipids into smaller molecules of higher volatility. Ex. 1010 ¶¶ 40–41 (citing Ex. 1013, at [57], ¶¶ 89, 91). Although Dr. Rozzell's testimony borders on conclusory, it is not, on the present record, contradicted by any evidence or argument to the contrary. Accordingly, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 1 over Van Antwerp.

b. Claim 2

Claim 2 of the '618 patent depends from claim 1 and adds a limitation requiring that the lipase be "covalently attached to [the] substrate or [the] coating." Ex. 1001, 15:28–29. Petitioner argues that Van Antwerp teaches or suggests this limitation. Pet. 38 (citing Ex. 1005, 5:29–43, 5:59–6:9). Van Antwerp discloses "chemically bond[ing]" enzyme-containing capsules to a catheter "by silicone chemistry," where at least some of the bonds are covalent. Ex. 1005, 5:29–43, 5:59–6:9. Accordingly, on the present record,

we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 2 over Van Antwerp.

c. Claim 3

Claim 3 depends from claim 1 and requires that the lipase be "non-covalently adhered to or admixed into [the] substrate or [the] coating." Ex. 1001, 15:30–32. Petitioner argues that Van Antwerp teaches or suggests this limitation. Pet. 38–39 (citing Ex. 1005, 2:46–50, 4:36–47). Van Antwerp discloses applying the enzyme to the catheter "as a thin micellar coating." Ex. 1005, 2:46–50. This coating adheres to the catheter "in a micellar array of microsphere particles." *Id.* at 4:36–47. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 3 over Van Antwerp.

C. Asserted Obviousness over Van Antwerp and Bostek

Petitioner argues that claims 4 and 5 would have been obvious to a person of ordinary skill in the art given the teachings of Van Antwerp and Bostek. Pet. 32, 39–40.

1. Bostek

Bostek relates to warming intravenous fluids during the administration of those fluids to patients. Ex. 1009, 561. Bostek discloses warming a bag of intravenous fluids to increase the temperature of the fluids being infused to 25 degrees Celsius or higher at the site of the infusion catheter. *Id.* at 564–65.

2. Analysis

Petitioner argues that all limitations of claims 4 and 5 are taught or suggested by the combination of Van Antwerp and Bostek. Pet. 39–40.

a. Claim 4

Claim 4 depends from claim 1 and adds a limitation requiring "heating [the] substrate or [the] coating or applying heat to a surface of said substrate or said coating subsequent to being contacted by a fingerprint." Ex. 1001, 15:33–35. Petitioner argues that this limitation is taught or suggested by Bostek. Pet. 39–40 (citing Ex. 1009, 564–65). Bostek discloses heating intravenous fluid before it is infused into a patient, and Bostek teaches that this heating causes the temperature of the fluid passing through the catheter to rise, which would cause the catheter and its coating to be warmed. Ex. 1009, 564–65. In addition, Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Bostek with those of Van Antwerp because Bostek provides specific examples of using a catheter, such as the catheter described in Van Antwerp, to administer fluids to a patient. Pet. 40. The use of Van Antwerp's catheter in Bostek's heating and infusing process appears on the present record to be no more than the combination of prior-art elements according to known methods to yield predictable results. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 4 over the combination of Van Antwerp and Bostek.

b. Claim 5

Claim 5 depends from claim 4 and adds a limitation requiring that the heating take place "for at least 30 minutes." Ex. 1001, 15:36–37. Petitioner argues that this limitation is taught or suggested by Bostek. Pet. 40 (citing Ex. 1009, 564–65). Bostek discloses infusing heated intravenous solution

for up to two hours. Ex. 1009, 564. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 5 over the combination of Van Antwerp and Bostek.

D. Asserted Obviousness over Van Antwerp and Moon

Petitioner argues that claims 6–9 would have been obvious to a person of ordinary skill in the art given the teachings of Van Antwerp and Moon. Pet. 32, 40–43.

1. Moon

Moon "relates to a monomer with anti-microbial characteristics, a polymeric compound with anti-microbial characteristics using the same, and manufacturing methods thereof." Ex. 1006, at [57]. Moon discloses a "polymeric resin composition" that is "particularly useful for medical supplies . . . such as catheters." *Id.* ¶ 59.

2. Analysis

Petitioner argues that all limitations of claims 6–9 are taught or suggested by the combination of Van Antwerp and Moon. Pet. 40–43.

a. Claim 6

Claim 6 depends from claim 1 and adds a limitation requiring that the substrate or coating "comprise[] an organic crosslinkable polymer resin." Ex. 1001, 16:17–18. Petitioner argues that Van Antwerp teaches or suggests this limitation.[10] Pet. 40 (citing Ex. 1005, 3:65–67). Van Antwerp discloses

[10] Although Petitioner includes claim 6 in the group of claims challenged as obvious over the combination of Van Antwerp and Moon, Petitioner does not rely on Moon to teach or suggest any limitation of claim 6. Pet. 32, 40.

making its catheter from polyethylene, which is an organic crosslinkable polymer resin. Ex. 1005, 3:65–67. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 6 over the combination of Van Antwerp and Moon.

b. Claim 7

Claim 7 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer resin comprise[] a functional group of acetoacetate, acid, amine, carboxyl, epoxy, hydroxyl, isocyanate, silane, vinyl, or combinations thereof." Ex. 1001, 16:19–22. Petitioner argues that Moon teaches or suggests this limitation. Pet. 40–41 (citing Ex. 1006 ¶¶ 59, 112, 115, 119). Moon discloses antimicrobial polymeric resin materials for use in medical supplies, such as catheters, and Moon discloses that these materials may include isocyanate, hydroxyl, or epoxy functional groups. Ex. 1006 ¶¶ 59, 112, 115, 119. In addition, Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Moon with those of Van Antwerp because Moon discloses making a catheter, such as that disclosed in Van Antwerp, from materials that have improved antimicrobial characteristics. Pet. 41. The use of Moon's materials to make Van Antwerp's catheter appears on the present record to be no more than the combination of prior-art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 417. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 7 over the combination of Van Antwerp and Moon.

c. Claim 8

Claim 8 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer resin [be] aminoplasts, melamine formaldehydes, carbamates, polyurethanes, polyacrylates, epoxies, polycarbonates, alkyds, vinyls, polyamides, polyolefins, phenolic resins, polyesters, polysiloxanes, or combinations thereof." Ex. 1001, 16:23–27. Petitioner argues that Van Antwerp teaches or suggests this limitation.[11] Pet. 41–42 (citing Ex. 1005, 3:65–67). Van Antwerp discloses making its catheter from polyethylene, which is a polyolefin. Ex. 1005, 3:65–67. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 8 over the combination of Van Antwerp and Moon.

d. Claim 9

Claim 9 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer [be] a hydroxyl-functionalized acrylate resin." Ex. 1001, 16:28–29. Petitioner argues that Moon teaches or suggests this limitation. Pet. 42–43 (citing Ex. 1006 ¶¶ 59, 112, 115, 120–22). Moon discloses some polymers that are hydroxyl-functionalized acrylate resins. Ex. 1006 ¶¶ 120–22. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 9 over the combination of Van Antwerp and Moon.

[11] Although Petitioner includes claim 8 in the group of claims challenged as obvious over the combination of Van Antwerp and Moon, Petitioner does not rely on Moon to teach or suggest any limitation of claim 8. Pet. 32, 41–42.

E. Asserted Obviousness over Van Antwerp and Hamade

Petitioner argues that claims 10 and 11 would have been obvious to a person of ordinary skill in the art given the teachings of Van Antwerp and Hamade. Pet. 32, 43–45.

1. Hamade

Hamade relates to "[a] novel method for controlled release of compounds having antimicrobial activity and a novel coating composition capable of controlled release of compounds having antimicrobial activity." Ex. 1007, at [57]. Hamade discloses producing a "compound having antimicrobial activity . . . by enzymatic reaction between an enzyme and a substrate." *Id.* at 3:29–31. The enzymes used in Hamade include an esterase, such as triacylglycerol lipase and lipoprotein lipase. *Id.* at 4:5–15.

2. Analysis

Petitioner argues that all limitations of claims 10 and 11 are taught or suggested by the combination of Van Antwerp and Hamade. Pet. 43–45.

a. Claim 10

Claim 10 depends from claim 1 and adds a limitation requiring that the lipase be "lipoprotein lipase, acylglycerol lipase, hormone-sensitive lipase, phospholipase A1, phospholipase A2, phospholipase C, phospholipase D, phosphoinositide phospholipase C, a lysophospholipase, or a galactolipase." Ex. 1001, 16:30–34. Petitioner argues that Hamade teaches or suggests this limitation. Pet. 43–44 (citing Ex. 1007, 4:7–15, 7:31–35). Hamade discloses a coating that produces antimicrobial activity using an enzyme that can be lipase, such as triacylglycerol lipase or lipoprotein lipase. Ex. 1007, 4:7–15, 7:31–35. In addition, Petitioner argues that a person of ordinary skill in the art would have been motivated to

combine the teachings of Hamade with those of Van Antwerp because a person of ordinary skill in the art would have sought enzymes that "exhibit enzymatic activity against various lipids." Pet. 44. The use of Hamade's lipases to coat Van Antwerp's catheter appears on the present record to be no more than the combination of prior-art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 417. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 10 over the combination of Van Antwerp and Hamade.

b. Claim 11

Claim 11 depends from claim 1 and adds a limitation requiring that the lipase be "a triacylglycerol lipase." Ex. 1001, 16:35–36. Petitioner argues that Hamade teaches or suggests this limitation. Pet. 44–45 (citing Ex. 1007, 4:7–15, 7:31–35). Hamade discloses a coating that produces antimicrobial activity using an enzyme that can be lipase, such as triacylglycerol lipase or lipoprotein lipase. Ex. 1007, 4:7–15, 7:31–35. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 11 over the combination of Van Antwerp and Hamade.

F. Asserted Obviousness over Schneider

Petitioner argues that claims 1–8, 10, and 11 would have been obvious to a person of ordinary skill in the art given the teachings of Schneider. Pet. 32, 45–53.

1. Schneider

Schneider "relates to a coating composition comprising at least one enzyme capable of acting on a compound, wherein said action results in the

formation of an antifouling species comprising an antifouling activity." Ex. 1004, at [57]. The enzymes used in Schneider include "an esterase, including a lipase." *Id.* ¶ 52. When a lipase is used, Schneider teaches that it "degrade[s] cell wall lipids and other lipid associated macro-molecules at the surface of microbial organisms." *Id.* ¶ 72.

2. Analysis

Petitioner argues that all limitations of claims 1–8, 10, and 11 are taught or suggested by Schneider. Pet. 46–53.

a. Claim 1

There is sufficient evidence, on the present record and for present purposes, that Schneider teaches or suggests "providing a substrate or a coating" and "associating a lipase with said substrate or said coating such that said lipase is capable of enzymatically degrading a component of a fingerprint." Pet. 46–47 (citing Ex. 1004 ¶¶ 50, 52, 74, 88–90, 96, 125, 247, 248, 253, 262, 269).

It is a closer case whether Schneider teaches or suggests "facilitating the removal of a fingerprint by vaporization from the lipase associated substrate or coating when contacted by a fingerprint." Petitioner has not directed us to record evidence that Schneider itself teaches or suggests the evaporation of bioorganic stains. Instead, Petitioner relies on the disclosure of the '618 patent and the testimony of Dr. Rozzell to show that lipase facilitates the vaporization of fingerprints inherently when the fingerprints are "in an environment that would support such vaporization," such as "an ambient environment consisting of air." Pet. 47–48 (citing Pet. 13–15; Ex. 1010 ¶¶ 35–41, 142–44). The '618 patent does not support a finding that it would have been known by a person of ordinary skill in the art either

that fingerprints contain low-volatility lipids or that fingerprint lipids could be broken into smaller, higher-volatility molecules by contact with a lipase, because the disclosure cited refers to the inventors' discovery of these facts, not the general knowledge in the art. Ex. 1001, 2:34–56. Dr. Rozzell's testimony, however, does suggest that a person of ordinary skill in the art would have known (1) that fingerprints contain compounds of different volatilities, (2) that the presence of more high-volatility compounds would increase the rate at which fingerprints vaporize, and (3) that lipase could catalyze degradation of lipids in fingerprints to break those lipids into smaller molecules of higher volatility. Ex. 1010 ¶¶ 40–41 (citing Ex. 1013, at [57], ¶¶ 89, 91). Although Dr. Rozzell's testimony borders on conclusory, it is not, on the present record, contradicted by any evidence or argument to the contrary. Accordingly, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 1 over Schneider.

b. Claim 2

Claim 2 of the '618 patent depends from claim 1 and adds a limitation requiring that the lipase be "covalently attached to [the] substrate or [the] coating." Ex. 1001, 15:28–29. Petitioner argues that this type of enzyme-substrate bonding was well known in the art. Pet. 48–49 (citing Ex. 1010 ¶ 42). The testimony of Dr. Rozzell, to which Petitioner cites, is supported by some evidence that covalent bonding of enzymes was known in the art. Ex. 1010, Attachment G. Also, on the present record, it is not contradicted by any evidence or argument to the contrary. Accordingly, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 2 over Schneider.

c. Claim 3

Claim 3 depends from claim 1 and requires that the lipase be "non-covalently adhered to or admixed into [the] substrate or [the] coating." Ex. 1001, 15:30–32. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 49 (citing Ex. 1004 ¶¶ 110, 263). Schneider discloses that its compositions "can be prepared simply by mixing the various ingredients at a temperature at which they are not adversely affected." Ex. 1004 ¶ 263. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 3 over Schneider.

d. Claim 4

Claim 4 depends from claim 1 and adds a limitation requiring "heating [the] substrate or [the] coating or applying heat to a surface of said substrate or said coating subsequent to being contacted by a fingerprint." Ex. 1001, 15:33–35. Petitioner argues that this limitation is taught or suggested by Schneider. Pet. 49–50 (citing Ex. 1004 ¶¶ 249, 269). Schneider discloses using its coating on the "external surface of a central heating system." Ex. 1004 ¶ 249. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 4 over Schneider.

e. Claim 5

Claim 5 depends from claim 4 and adds a limitation requiring that the heating take place "for at least 30 minutes." Ex. 1001, 15:36–37. Citing to the testimony of Dr. Rozzell, Petitioner argues that this limitation is taught or suggested by Schneider. Pet. 49–50 (citing Ex. 1004 ¶¶ 249, 269; Ex. 1010 ¶ 149). Dr. Rozzell's testimony is some evidence that a person of

ordinary skill in the art would have known that the "external surface of a central heating system" of Schneider could be "exposed to heated air for several hours each day." Ex. 1004 ¶ 249; Ex. 1010 ¶ 149. That testimony is not, on the present record, contradicted by any evidence or argument to the contrary. Accordingly, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 5 over Schneider.

f. Claim 6

Claim 6 depends from claim 1 and adds a limitation requiring that the substrate or coating "comprise[] an organic crosslinkable polymer resin." Ex. 1001, 16:17–18. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 50 (citing Ex. 1004 ¶¶ 225, 253). Schneider discloses making its coatings from alkyd, epoxy, urethane, polyester, vinyl, or phenolic resins, all of which are organic crosslinkable polymer resins. Ex. 1004 ¶ 253. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 6 over Schneider.

g. Claim 7

Claim 7 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer resin comprise[] a functional group of acetoacetate, acid, amine, carboxyl, epoxy, hydroxyl, isocyanate, silane, vinyl, or combinations thereof." Ex. 1001, 16:19–22. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 50–51 (citing Ex. 1004 ¶ 253; Ex. 1010 ¶ 153). Schneider discloses making its coatings from alkyd, epoxy, urethane, or phenolic resins. Ex. 1004 ¶ 253. Dr. Rozzell testifies that epoxy, urethane, and phenolic resins "comprise epoxy, isocyanate, and

hydroxyl functional groups, respectively." Ex. 1010 ¶ 153. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 7 over Schneider.

h. Claim 8

Claim 8 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer resin [be] aminoplasts, melamine formaldehydes, carbamates, polyurethanes, polyacrylates, epoxies, polycarbonates, alkyds, vinyls, polyamides, polyolefins, phenolic resins, polyesters, polysiloxanes, or combinations thereof." Ex. 1001, 16:23–27. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 51 (citing Ex. 1004 ¶ 253). Schneider discloses making its coatings from alkyd, epoxy, urethane, polyester, vinyl, or phenolic resins, all of which are organic crosslinkable polymer resins. Ex. 1004 ¶ 253. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 8 over Schneider.

i. Claim 10

Claim 10 depends from claim 1 and adds a limitation requiring that the lipase be "lipoprotein lipase, acylglycerol lipase, hormone-sensitive lipase, phospholipase A1, phospholipase A2, phospholipase C, phospholipase D, phosphoinositide phospholipase C, a lysophospholipase, or a galactolipase." Ex. 1001, 16:30–34. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 52–53 (citing Ex. 1004 ¶ 74). Schneider discloses that its enzyme can be a lipase, such as triacylglycerol lipase or lipoprotein lipase. Ex. 1004 ¶ 74. Accordingly, on the present

record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 10 over Schneider.

j. Claim 11

Claim 11 depends from claim 1 and adds a limitation requiring that the lipase be "a triacylglycerol lipase." Ex. 1001, 16:35–36. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 53 (citing Ex. 1004 ¶ 74). Schneider discloses that its enzyme can be a lipase, such as triacylglycerol lipase or lipoprotein lipase. Ex. 1004 ¶ 74. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 11 over Schneider.

G. Asserted Obviousness over Schneider and McDaniel

Petitioner argues that claim 9 would have been obvious to a person of ordinary skill in the art given the teachings of Schneider and McDaniel. Pet. 32, 51–52.

1. McDaniel

McDaniel relates to "novel coatings and paints comprising a biomolecule composition." Ex. 1008, at [57]. McDaniel discloses a "composition . . . that comprises a bioactive molecule such as an enzyme composition that retains activity after being admixed with paint." *Id.* ¶ 23. In addition to "paint," McDaniel teaches mixing its enzyme with "a thermosetting acrylic resin," which can be crosslinked with binders comprising hydroxyl functional groups. *Id.* ¶¶ 503–504.

2. Analysis

Petitioner argues that all limitations of claim 9 are taught or suggested by the combination of Schneider and McDaniel. Pet. 51–52. Claim 9

depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer [be] a hydroxyl-functionalized acrylate resin." Ex. 1001, 16:28–29. Petitioner argues that McDaniel teaches or suggests this limitation. Pet. 52 (citing Ex. 1008 ¶¶ 379, 454, 503, 504, 510, 512). McDaniel discloses some polymers that are hydroxyl-functionalized acrylate resins. Ex. 1008 ¶¶ 503–04.

In addition, Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of McDaniel with those of Schneider because a person of ordinary skill in the art would have sought "material compositions that are well-known to provide desirable performance for enzyme-containing polymeric coatings and a hydroxyl-functionalized acrylate resin is well-known to provide desirable performance for enzyme-containing polymeric coatings." Pet. 52 (citing Ex. 1010 ¶¶ 162–63). The use of McDaniel's hydroxyl-functionalized acrylate resin in Schneider's coating composition appears on the present record to be no more than the combination of prior-art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 417. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 9 over the combination of Schneider and McDaniel.

H. Asserted Obviousness over Drevon

Petitioner argues that claims 1–9 would have been obvious to a person of ordinary skill in the art given the teachings of Drevon. Pet. 32, 53–59.

1. Drevon

Drevon relates to "strategies to immobilize enzymes into various polymer[s] and coatings." Ex. 1003, 3.[12] It discloses that "enzymes were inserted into various polymer networks," including "[p]olyurethane foams." *Id.* at 19. The enzymes used included lipase. *Id.* at 79.

2. Analysis

Petitioner argues that all limitations of claims 1–9 are taught or suggested by Drevon. Pet. 53–59.

a. Claim 1

There is sufficient evidence, on the present record and for present purposes, that Drevon teaches or suggests "providing a substrate or a coating" and "associating a lipase with said substrate or said coating such that said lipase is capable of enzymatically degrading a component of a fingerprint." Pet. 54–55 (citing Ex. 1003, 18–20, 70, 77, 79, 88, 169, 214).

It is a closer case whether Drevon teaches or suggests "facilitating the removal of a fingerprint by vaporization from the lipase associated substrate or coating when contacted by a fingerprint." Petitioner has not directed us to record evidence that Drevon itself teaches or suggests the evaporation of bioorganic stains. Instead, Petitioner relies on the disclosure of the '618 patent and the testimony of Dr. Rozzell to show that lipase facilitates the vaporization of fingerprints inherently when the fingerprints are "in an environment that would support such vaporization," such as "an ambient environment consisting of air." Pet. 55–56 (citing Pet. 13–15; Ex. 1010

[12] Citations to Drevon refer to the page numbers inserted into the lower right corners of Ex. 1003 by Petitioner, not to the original page numbers in the lower center of each page.

¶¶ 35–41, 172). The ’618 patent does not support a finding that it would have been known by a person of ordinary skill in the art either that fingerprints contain low-volatility lipids or that fingerprint lipids could be broken into smaller, higher-volatility molecules by contact with a lipase, because the disclosure cited refers to the inventors’ discovery of these facts, not the general knowledge in the art. Ex. 1001, 2:34–56. Dr. Rozzell’s testimony, however, does suggest that a person of ordinary skill in the art would have known (1) that fingerprints contain compounds of different volatilities, (2) that the presence of more high-volatility compounds would increase the rate at which fingerprints vaporize, and (3) that lipase could catalyze degradation of lipids in fingerprints to break those lipids into smaller molecules of higher volatility. Ex. 1010 ¶¶ 40–41 (citing Ex. 1013, at [57], ¶¶ 89, 91). Although Dr. Rozzell’s testimony borders on conclusory, it is not, on the present record, contradicted by any evidence or argument to the contrary. Accordingly, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 1 over Drevon.

b. Claim 2

Claim 2 of the ’618 patent depends from claim 1 and adds a limitation requiring that the lipase be “covalently attached to [the] substrate or [the] coating.” Ex. 1001, 15:28–29. Petitioner argues that Drevon teaches or suggests this limitation. Pet. 56 (citing Ex. 1003, 18, 57–58). Drevon discloses “the covalent attachment of the enzyme onto or into a solid support.” Ex. 1003, 57. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 2 over Drevon.

c. Claim 3

Claim 3 depends from claim 1 and requires that the lipase be "non-covalently adhered to or admixed into [the] substrate or [the] coating." Ex. 1001, 15:30–32. Petitioner argues that Drevon teaches or suggests this limitation. Pet. 56 (citing Ex. 1003, 18, 56–57, 76–77). Drevon discloses that its enzymes can be immobilized by "[s]everal non-covalent linkages . . . including ionic and metal bindings as well as physical adsorption." Ex. 1003, 56. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 3 over Drevon.

d. Claim 4

Claim 4 depends from claim 1 and adds a limitation requiring "heating [the] substrate or [the] coating or applying heat to a surface of said substrate or said coating subsequent to being contacted by a fingerprint." Ex. 1001, 15:33–35. Petitioner argues that this limitation is taught or suggested by Drevon. Pet. 56 (citing Ex. 1003, 18, 58). Drevon discloses that one purpose of its enzyme immobilization is "to prevent enzyme unfolding upon heating." Ex. 1003, 18. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 4 over Drevon.

e. Claim 5

Claim 5 depends from claim 4 and adds a limitation requiring that the heating take place "for at least 30 minutes." Ex. 1001, 15:36–37. Petitioner argues that a person of ordinary skill in the art would have known that "substrate surfaces and coating surfaces of . . . consumer products that are exposed to bioorganic stains are routinely subjected to heating for at least 30

minutes during their routine use." Pet. 57 (citing Ex. 1010 ¶¶ 178–79). Dr. Rozzell testifies to this, although his testimony is somewhat conclusory. Ex. 1010 ¶¶ 178–79. That testimony is not, on the present record, contradicted by any evidence or argument to the contrary. Accordingly, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 5 over Drevon.

f. Claim 6

Claim 6 depends from claim 1 and adds a limitation requiring that the substrate or coating "comprise[] an organic crosslinkable polymer resin." Ex. 1001, 16:17–18. Petitioner argues that Drevon teaches or suggests this limitation. Pet. 57–58 (citing Ex. 1003, 68, 70, 77, 101, 106, 169). Drevon discloses making its coatings from polyurethane and acrylic resins, as well as acrylate polymer or polyacrylate, all of which are organic crosslinkable polymer resins, and Drevon discloses crosslinking of polyurethane. Ex. 1003, 68, 70, 77, 101, 106, 169. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 6 over Drevon.

g. Claim 7

Claim 7 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer resin comprise[] a functional group of acetoacetate, acid, amine, carboxyl, epoxy, hydroxyl, isocyanate, silane, vinyl, or combinations thereof." Ex. 1001, 16:19–22. Petitioner argues that Drevon teaches or suggests this limitation. Pet. 58 (citing Ex. 1003, 58, 68, 70, 101, 106). Drevon discloses that its polymer resins can include amine, hydroxyl, and isocyanate functional groups. Ex. 1003, 58, 68, 70, 101, 106. Accordingly, on the present record, we determine that Petitioner has

established a reasonable likelihood of prevailing in showing the obviousness of claim 7 over Drevon.

h. Claim 8

Claim 8 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer resin [be] aminoplasts, melamine formaldehydes, carbamates, polyurethanes, polyacrylates, epoxies, polycarbonates, alkyds, vinyls, polyamides, polyolefins, phenolic resins, polyesters, polysiloxanes, or combinations thereof." Ex. 1001, 16:23–27. Petitioner argues that Drevon teaches or suggests this limitation. Pet. 58–59 (citing Ex. 1003, 68, 70, 101, 169). Drevon discloses using polyacrylate and polyurethane. Ex. 1003, 68, 70, 101, 169. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 8 over Drevon.

i. Claim 9

Claim 9 depends from claim 6 and adds a limitation requiring that the "organic crosslinkable polymer [be] a hydroxyl-functionalized acrylate resin." Ex. 1001, 16:28–29. Petitioner argues that Drevon teaches or suggests this limitation. Pet. 59 (citing Ex. 1003, 101, 106, 169). Drevon discloses some polymers that are hydroxyl-functionalized acrylate resins. Ex. 1003, 101, 106, 169. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 9 over Drevon.

I. Asserted Obviousness over Drevon and Schneider

Petitioner argues that claims 10 and 11 would have been obvious to a person of ordinary skill in the art given the teachings of Drevon and Schneider. Pet. 33, 59–63.

Claim 10 depends from claim 1 and adds a limitation requiring that the lipase be "lipoprotein lipase, acylglycerol lipase, hormone-sensitive lipase, phospholipase A1, phospholipase A2, phospholipase C, phospholipase D, phosphoinositide phospholipase C, a lysophospholipase, or a galactolipase." Ex. 1001, 16:30–34. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 60–61 (citing Ex. 1004 ¶ 74). Schneider discloses that its enzyme can be a lipase, such as triacylglycerol lipase or lipoprotein lipase. Ex. 1004 ¶ 74. In addition, Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the teachings of Schneider with those of Drevon because a person of ordinary skill in the art would have sought "enzymes that exhibit enzymatic activity against various lipids," in light of Drevon's suggestion that immobilized enzymes could be used for antifouling purposes. Pet. 60–61. The use of Schneider's lipases in Drevon's polymer matrices appears on the present record to be no more than the combination of prior-art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 417. Accordingly, on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing in showing the obviousness of claim 10 over the combination of Drevon and Schneider.

Claim 11 depends from claim 1 and adds a limitation requiring that the lipase be "a triacylglycerol lipase." Ex. 1001, 16:35–36. Petitioner argues that Schneider teaches or suggests this limitation. Pet. 61–63 (citing Ex. 1004 ¶ 74). Schneider discloses that its enzyme can be a lipase, such as triacylglycerol lipase or lipoprotein lipase. Ex. 1004 ¶ 74. Accordingly, on the present record, we determine that Petitioner has established a reasonable

likelihood of prevailing in showing the obviousness of claim 11 over the combination of Drevon and Schneider.

J. Pending Motion to Dismiss

On March 3, 2017, Patent Owner filed a motion to dismiss this proceeding on the ground of Eleventh Amendment sovereign immunity. Paper 23. This decision does not resolve that motion. We will rule on Patent Owner's motion in due course.

CONCLUSION

Upon consideration of the Petition, the Preliminary Response, and the evidence before us, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that (1) claims 1–3 are unpatentable under 35 U.S.C. § 103 as obvious over Van Antwerp; (2) claims 4 and 5 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Van Antwerp and Bostek; (3) claims 6–9 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Van Antwerp and Moon; (4) claims 10 and 11 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Van Antwerp and Hamade; (5) claims 1–8, 10, and 11 are unpatentable under 35 U.S.C. § 103 as obvious over Schneider; (6) claim 9 is unpatentable under 35 U.S.C. § 103 as obvious over the combination of Schneider and McDaniel; (7) claims 1–9 are unpatentable under 35 U.S.C. § 103 as obvious over Drevon; and (8) claims 10 and 11 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Drevon and Schneider. Accordingly, we institute *inter partes* review of these claims on these grounds. The Board has not made a final determination on the patentability of any challenged claim.

ORDER

It is hereby

ORDERED that, pursuant to 35 U.S.C. § 314, an *inter partes* review is hereby instituted to determine:

Whether claims 1–3 are unpatentable under 35 U.S.C. § 103 as obvious over Van Antwerp;

Whether claims 4 and 5 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Van Antwerp and Bostek;

Whether claims 6–9 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Van Antwerp and Moon;

Whether claims 10 and 11 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Van Antwerp and Hamade;

Whether claims 1–8, 10, and 11 are unpatentable under 35 U.S.C. § 103 as obvious over Schneider;

Whether claim 9 is unpatentable under 35 U.S.C. § 103 as obvious over the combination of Schneider and McDaniel;

Whether claims 1–9 are unpatentable under 35 U.S.C. § 103 as obvious over Drevon; and

Whether claims 10 and 11 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Drevon and Schneider;

FURTHER ORDERED that no ground other than those specifically identified above is authorized for this *inter partes* review;

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial commencing on the entry date of this decision; and

FURTHER ORDERED that briefing on Patent Owner's motion to dismiss shall continue as previously ordered, and we will issue a ruling on the motion to dismiss in due course.

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