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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VF OUTDOOR, LLC,
Petitioner,

v.

COCONA, INC.,
Patent Owner.

Case No.: IPR2018-00190
Patent No.: 8,945,287

**SECOND DECLARATION OF ABIGAIL OELKER, PH.D. IN SUPPORT
OF PETITIONER'S REPLY TO THE PATENT OWNER RESPONSE**

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I, Abigail Oelker, Ph.D., hereby state the following:

I. INTRODUCTION AND QUALIFICATIONS

1. I have been retained by the law firm of Merchant & Gould P.C. on behalf of Petitioner VF Outdoor, LLC (“Petitioner” or “VF Outdoor”) to provide certain expert opinions.

2. I previously provided a declaration dated November 15, 2017 in support of VF Outdoor’s Petition for *Inter Partes* Review of Patent No. 8,945,287 (“the ’287 patent”) (hereinafter, “First Declaration;” Ex. 1005), which I incorporate herein by reference in its entirety. I now provide this Second Declaration in Support of Petitioner’s Reply to the Patent Owner Response (hereinafter “Second Declaration”).

3. This Second Declaration is generally based upon my professional knowledge and expertise in the fields of chemical engineering, chemistry, polymeric materials and textiles, as well as my specific expertise in the field of the ’287 patent, which was discussed in my First Declaration. (Ex. 1005, ¶¶4-11 (“Background and Experience;” *see also* Ex. 1058 (“Updated Curriculum Vitae”).) This Second Declaration is also based upon my analysis of the declarations submitted by the Patent Owner, the depositions of those declarants, as well as the

scientific references discussed herein that directly rebut the positions taken by those declarants.

4. This Declaration is based on information currently available to me. I reserve the right to continue my investigation and analysis, which may include the review of documents and information not yet produced. I further reserve the right to expand upon, supplement or otherwise modify my opinions and conclusions as warranted, including in response to any additional information that may become available to me in the future.

II. LEGAL STANDARDS

5. In my First Declaration, I provided a summary of the legal principles of claim construction, anticipation and obviousness based on my understanding of those legal principles from counsel for VF Outdoor. (Ex. 1005, ¶¶17-37 (“Legal Standards”).) To the extent that additional legal principles are necessary to reply to the Patent Owner Response, I provide my understanding of those additional principles from counsel in the sections to which they pertain.

III. LEVEL OF ORDINARY SKILL IN THE ART

6. In my First Declaration, I provided my opinions on the level of skill of the Person of Ordinary Skill in the Art (POSITA) to which the '287 patent is directed. (Ex. 1005, ¶¶38-39 (“Level of Ordinary Skill in the Art”).) My opinion has not changed in this regard. My analysis and opinions herein are made from the

perspective of a POSITA as previously defined, which I understand was adopted by the Board in this proceeding. (*See* IPR2018-00190, Paper 14 at 4-5.)

IV. MATERIALS CONSIDERED

7. In addition to the materials considered in my First Declaration (Ex. 1005, ¶14), I have reviewed and considered the following further documents and information:

Exhibit No./ Paper No.	Description
Paper No. 1	Petition for Inter Partes Review of Patent No. 8,945,287
Paper No. 12	Patent Owner Preliminary Response
Paper No. 14	Decision, Institution of <i>Inter Partes</i> Review, 35 U.S.C. § 314(a) (“Institution Decision”)
Paper No. 20	Patent Owner Response
Ex. 2001	Declaration of Dr. Gregory Haggquist
Ex. 2002	Rosato’s Plastics Encyclopedia and Dictionary
Ex. 2003	ASTM E-96
Ex. 2005	Declaration of Stephen J. Callan
Ex. 2006	Declaration of Charles A. Daniels
Ex. 2007	Deposition Transcript of Abigail Oelker
Ex. 2009	ASTM E96 vs F1294
Ex. 2010	Cabot Corp. website on carbon black
Ex. 2011	Second Declaration of Dr. Gregory Haggquist
Ex. 2029	Request for Certificate of Correction for U.S.P.N 7,247,374
Ex. 2030	Certificate of Correction for U.S.P.N 7,247,374
Ex. 1045	Deposition Transcript of Jeffrey Bowman (“Bowman Dep.”), dated December 4, 2018
Ex. 1046	Deposition Transcript of Dr. Gregory W. Haggquist (“Haggquist Dep.”), dated December 5, 2018
Ex. 1047	Deposition Transcript of Dr. Charles A. Daniels (“Daniels Dep.”), dated December 7, 2018
Ex. 1048	Deposition Transcript of Stephen J. Callan (“Callan Dep.”), dated December 14, 2018

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Ex. 1049	John A. Texter et al., “Water Sorption in a Dextran Gel” (Callan Dep., Ex. 15)
Ex. 1050	Pavia et al., “Introduction to Organic Laboratory Techniques – A Microscale Approach” (Callan Dep., Ex. 11)
Ex. 1051	Wang et al., “Micro-Porous Layer with Composite Carbon Black for PEM Fuel Cells” (Callan Dep., Ex. 9)
Ex. 1052	Plaintiff’s Responses to Defendant VF Outdoor, LLC’s First Set of Interrogatories to Cocona, Inc. (Bowman Dep., Ex. 4)
Ex. 1053	“What is the Activated Carbon?” (May 9, 2013), retrieved from https://www.jurassiccarbon.com/blogs/news/7842073-what-is-the-activated-carbon (Haggquist Depo., Ex. 4)
Ex. 1054	Marenco et al., “Fluorescent-based genetic analysis for a microfluidics device” (Mar. 1, 2004) (Callan Depo., Ex. 12) (Daniels Depo., Ex. 6)
Ex. 1055	Marenco et al., “Fluorescent-Based Genetic Analysis for a Microfluidics Device” (Mar. 2004) (Daniels Depo., Ex. 7)
Ex. 1056	Asbury Carbon SDS: Coconut Shell Activated Carbon (Callan Depo. Ex. 5)
Ex. 1057	Remington’s The Science and Practice of Pharmacy (21 st Ed., ©2006)
Ex. 1058	Updated Expert Curriculum Vitae

**V. REPLY TO PATENT OWNER RESPONSE AND EXPERT
DECLARATIONS**

A. Claim Construction

8. My First Declaration included my opinions on the broadest reasonable interpretation of a number of terms recited in the ’287 patent claims, including those having explicit definitions in the ’287 specification. (Ex. 1005, ¶¶93-107.) I incorporate those interpretations into this Second Declaration, and herein supplement my prior analysis in view of the Board’s Institution Decision and in

reply to the Patent Owner's positions on some of the claim terminology. I also provide my opinions on the broadest reasonable interpretation of additional claim terms and phrases, as necessary, to address specific arguments made by the Patent Owner and its experts.

1. "Active Particles"

9. In its Institution Decision, the Board adopted the following initial construction of "active particles" – "particles that have the capacity to cause chemical reactions at the surface or physical reactions, such as, adsorb or trap substances." (Institution Decision, Paper 14 at 10.) I understand that the Patent Owner contests the Board's construction as "unreasonably broad" and asserts that "active particles" are limited to "particles that adsorb or trap substances on their surface." (PO Response, Paper 20 at 6.) I do not agree. A POSITA would not interpret "active particles" so narrowly. It is my opinion that the Board's initial construction is better aligned with the term's broadest reasonable interpretation than Patent Owner's proposal here.

10. The Patent Owner submits that "active particles" can only be "active" if they adsorb or trap substances *on their surfaces*, and that allowing the term to embrace particles that react by "absorption rather than adsorption ... has the effect of reading the word 'active' right out of the claims" (Paper 20 at 6, 8-9

(emphasis original).) Patent Owner also argues that the '287 patent itself “never mentions absorption, absorb, etc.”(*Id.* at 10.) I disagree.

11. As stated in my First Declaration, the '287 specification “relates to *active particle-enhanced membranes* ... [and] is particularly applicable to quick drying, *odor-absorbing*, anti-static membranes ... and methods of making and using the same.” (Ex. 1005, ¶97 *citing* Ex. 1001, 2:12-22 (emphasis added).) The '287 specification makes clear that the “active particles” are identified as “active” because they impart these properties to enhance membranes - as well as additional properties such as moisture management, ultraviolet light protection, chemical protection, bio-hazard protection, fire retardance, antimicrobial protection, and other properties - by a variety of different mechanisms of activity. (Ex.1001, 3:61-4:5; *see also* FIG. 5, 10:11-18 (“it was found that incorporating active particles ... into the base material increased the ability of the base material to *absorb IR light*”). Thus, it is by virtue of their capacity to impart the various properties to enhance membranes that the particles are designated as “active” by the '287 patent - and not based on any particular mechanism, such as adsorption. (Ex.1001, 4:4-5 (“These particles may provide such properties because they are ‘active.’”).

12. Now, while it also is true that the '287 patent discusses particles that are active because “the surface of these particles may be active” and includes “[c]ertain types of active particles (such as activated carbon) hav[ing] an adsorptive

property because each particle has a large surface area made up of a multitude of pores[,]” a POSITA considering the full import of the specification would not have limited “active particles” to only those particles that “adsorb or trap substances on their surface.” (Paper 20 at 6-7, 12 *citing* Ex.1001, 4:4-21) Instead, a POSITA would recognize adsorptive particles as a *limited subset* of particles within the *larger genus* of “active particles” disclosed and claimed in the ’287 patent. A POSITA would understand this to be so for a number of reasons.

13. For one, dependent claims from the ’287 patent expressly provide for water-proof breathable membranes comprising “active particles selected from the group consisting of antibacterial, antiviral, antimicrobial, antifungal particles, and any suitable combination thereof.” (Ex. 1001, 11:8-11 (claim 9).) And further dependent claims call for specific active particles, such as baking soda, p-methoxy-2-ethoxy-ethyl ester cinnamic acid (cinoxate)¹ and zinc oxide², which a POSITA

¹ See e.g., Remington’s The Science and Practice of Pharmacy (21st Ed., ©2006), which describes cinoxate as a “**viscous liquid**” “**sunscreen** that **absorbs UV light** at 270 to 328 nm and has a relatively **high molar absorptivity**.” (Ex. 1057 at 1290 (emphasis added).) Accordingly, cinoxate, one of the claimed “active particles” is not even a particle, but a liquid, thus further establishing the breadth of “active particles.”

² See e.g., Saito “Antibacterial, deodorizing and UV absorbing materials obtained by zinc oxide (ZnO) coated fabrics”; *J. Coated Fabrics* (1993), 23, pp. 150-154 (cited on the front pages of the ’287 patent), which establishes that zinc oxide was a well-known **UV absorbent** that also “functions as a **strong gas absorbent** that **absorbs odor** ingredients fast and effectively.” (Ex. 1035 at Abstract, 150, 154 (emphasis added).)

would understand to be “active” based on their ability to absorb substances (e.g., odor (baking soda and zinc oxide) and/or light (cinoxate and zinc oxide), albeit by different mechanisms. (Ex. 1001, 11:13-19 (claim 10), 12:45-51 (claim 37).) The ’287 specification contains similar disclosures to support that the term “active particles” embraces particles “that improve or add various desirable properties to the membrane” (Ex. 1001, 2:23-27 (moisture vapor transport capability, anti-static properties, stealth properties), 3:61-4:3), and particles having the capacity to trap substances or light via absorption. (*Id.* at 2:12-22 (odor absorbance, IR absorbance), FIG. 5 and 10:11-22 (IR absorbance), 4:22-27 (absorptive particles, including baking soda, cinoxate and zinc oxide).

14. Second, the ’287 patent specification and claims define “active particles” as including silica gel particles (Ex. 1001, 4:22-27, 12:45-51 (claim 37).) Patent Owner’s expert Charles Daniels has characterized “silica gel” as an “**absorbing substance** ... [that] imbibes a liquid such as water, causing the particles to swell microscopically to macroscopically.” (Ex. 2006, ¶43.) In my opinion, the inclusion of silica gel within the class of “active particles” – taken in view of Dr. Daniel’s characterization of silica gel as a water absorbing material – establishes that the inventor intended “active particles” to be broader than just “particles that adsorb or trap substances on their surface.” Indeed, Dr. Daniels testimony supports my prior opinions that “active particles” include particles that are capable of a wider

variety of physical reactions, including the ability to adsorb, trap, or absorb substances, such as water. (Ex. 1005, ¶¶45, 99.)

15. Furthermore, while Patent Owner and its experts advocate a narrow construction by referencing Figure 1 of *Haggquist* (Ex. 1004), which is said to “illustrate[] ... that the pores of the active particle are all at the surface” (Paper 20 at 7, 12-13; Ex. 2005, ¶¶31-32.), a POSITA would appreciate that the “active particles” defined by the ’287 specification are of broader scope than those described in *Haggquist*. To emphasize this point, I provide the following comparison between the ’287 patent and *Haggquist* disclosures that, in my view, supports an intent by the inventor (Dr. *Haggquist*) to broaden the scope of “active particles” in the ’287 patent (*vis-à-vis Haggquist*, Ex. 1004).

<i>Haggquist</i> – “Active Particles”	’287 Patent – “Active Particles”
<p>These particles can provide such properties because they are “active”. <u>Active particles are active</u> because they have the <i>capacity to adsorb or trap substances</i> (Ex. 1004 at [0004])</p> <p><u>Active particles have</u> an adsorptive property because each particle has a multitude of pores (e.g., pores on the order of thousands, tens of thousands, or hundreds of thousands per particle) (<i>Id.</i>)</p>	<p>These particles may provide such properties because they are “active.” That is, the surface of these particles <u>may be</u> active. <u>Surface active particles are active</u> because they have the capacity to cause chemical reactions at the surface or physical reactions, such as, adsorb or trap substances (Ex. 1001, 4:4-17.)</p> <p><u>Certain types of active particles ... have</u> an adsorptive property because each particle has a large surface area made up of a multitude of pores (e.g., pores on the order of thousands, tens of</p>

	thousands, or hundreds of thousands per particle) (<i>Id.</i>)
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As shown above, the '287 patent expanded the scope of “active particles” over the incorporated *Haggquist* publication by stating only *certain types* of particles are “active” based on surface properties (e.g., due to a large surface area made up of a multitude of pores), confirming to a POSITA that particles may also be “active” by trapping substances through other mechanisms. The '287 patent’s expanded definition (as compared with *Haggquist*, Ex. 1004) further supports my previous opinions – that the term “active particles” does not exclude particles that physically react through absorption and is not narrowly limited to particles that “adsorb or trap substances on their surface” as argued by Patent Owner. (Ex. 1005, ¶¶45, 99.) In his deposition during discussion of his first declaration (Ex. 2001, ¶8), Dr. Haggquist acknowledged his definition of “active particle” did not rule out the possibility that the active particles could also absorb, as well as adsorb. (Ex. 1046, 115:14 – 117:1).

16. In its response, Patent Owner now also argues that “active particles” should be further limited in view of a dictionary definition of “activation” taken from Rosato’s *Plastics Encyclopedia and Dictionary* (Ex. 2002) – “activation 1. Basically it is any process whereby a substance is treated to develop adsorptive properties.” (Paper 20 at 11; Ex. 2005, ¶¶24-25.) First, this is not a definition of

“active particle,” but “activation.” Second, in my opinion, the ’287 specification does not require that “active particles” must be somehow treated to make them “active particles.” Indeed, while the ’287 specification recites *activated* carbon and *activated* alumina as examples among a much longer listing of active particles, it does not require that particles must be processed (“activated”) in some way, and certainly does not require that a particle must be activated to “develop adsorptive properties” by creating pores or otherwise. Instead, the specification speaks to “active particles to enhance *performance activity* in the base material” (Ex. 1001, 6:13-18 (emphasis added)) and clearly discloses “active particles” that trap water, odors and even light through an absorption mechanism, such as baking soda, cinoxate, zinc oxide, and silica gel (the claimed “active particle” silica gel is described as an “absorbing substance” by Patent Owner’s expert Dr. Daniels; Ex. 2006, ¶43) (*supra*, ¶¶13-14). Moreover, *Haggquist*, incorporated by reference, states that certain active particles, such as volcanic rock, have naturally occurring pores. (Ex. 1004, [0028]).

17. In sum, a POSITA would not conclude, after reviewing the ’287 specification, claims, file history and the incorporated *Haggquist* publication that active particles are limited to “particles that adsorb or trap substances on their surface.” A POSITA would further disagree with the Patent Owner’s assertion that “expanding the meaning of ‘active particles’ to include ... absorptive particles

would contravene the scope of the invention disclosed in the '287 patent” or that it would “defeat ... the very purpose of the Patent.” (Paper 20 at 11, 14.) To the contrary, it is my opinion that the Patent Owner’s proposal imports only a very specific subset of “active particles” from the '287 specification into the claims – i.e., only the “*certain types* of active particles ... hav[ing] an adsorptive property ... [based on] a large surface area made up of a multitude of pores.” (Ex. 1001, 4:12-19 (emphasis added).) Based on my understanding of claim construction principles from counsel and the Board, this is not the correct result. The Board’s construction - “particles that have the capacity to cause chemical reactions at the surface or physical reactions, such as, adsorb or trap substances” - better comports with the broadest reasonable interpretation of “active particles.”³

2. “First Thickness”

18. The Board adopted the following initial construction of “first thickness” – “the thickness of a base material,’ which base material may include

³ I agree with Patent Owner’s experts that the Board’s construction could cover absorptive particles (Ex. 2005, ¶23; Ex. 2006, ¶64 (*citing* Paper 14 at 16-17, 23-24)), even though that construction does not expressly recite “absorb.” But this is consistent with Dr. Haggquist’s deposition testimony where he said his definition of “active particle” did not exclude absorption. (Ex. 1046, 115:14 – 117:1). In any event, and for the reasons discussed below, whether the Board’s construction covers absorption does not affect patentability because the Sephadex and Black Pearls 2000 particles disclosed by *Dutta* and *Halley*, respectively, are described in the prior art scientific literature as *adsorbing* or trapping water. Thus, under either party’s definition, the challenged claims are not patentable.

active particles.” (Paper 14 at 12.) Patent Owner has contested the Board’s construction, asserting that the “first thickness” is a “first layer or membrane,” which *cannot* include any active particles. (Paper 20 at 15, 17-18.) I do not agree with Patent Owner’s position, and it is my opinion that a POSITA would not interpret the “first thickness” in this way. While the Board adopted a slightly different definition for “first thickness” than offered in my First Declaration, it is my opinion that the Board’s initial construction better reflects the term’s broadest reasonable interpretation.

19. First, I disagree with the Patent Owner that “[c]laim 27 of the [’287] Patent is directed to a two-layer waterproof composition with the first layer being a liquid impermeable breathable cured base material, and the second layer being active particles applied to the cured base material.” (Paper 20 at 14 (emphasis added), 16.) The plain language of the claim 27 does not support Patent Owner’s proposed scope, and the ’287 specification does not direct a POSITA to any two-layer configurations specifically composed of a “cured base material” layer upon which a layer of a “plurality of active particles” is applied. Instead, claim 27 is broadly directed to a water-proof composition comprising a liquid impermeable breathable cured base material “in contact with” a plurality of active particles. (Ex. 1001, 12:1-7.)

20. The '287 specification supports this interpretation. As discussed in my First Declaration, the specification describes several embodiments where active particles are mixed with and suspended in a solution of base material prior to curing. (Ex. 1005, ¶¶94-96 *citing e.g.*, Ex. 1001, 8:54-64 (“protected activated carbon was suspended in the polyurethane solution ... [and] [t]he mixture was dried and cured in an oven ... resulting in a membrane ...”).) Moreover, the abstract of the '287 patent specifically describes active-particle enhanced membranes with “active particles ***incorporated in*** the membrane [to] improve or add various desirable properties to the membrane” (Ex. 1001, Abstract (emphasis added), *see also* 2:42-43 (in some embodiments, the membrane may include polyurethane and solid particles).)

21. Figure 1 of the '287 patent also describes these membranes. Here, a “base material solution and active particles may be mixed together [such that] the active particles may be dispersed throughout the base material solution to provide a mixture having a uniform consistency.” (Ex. 1001, 6:65-7:1.) As discussed for Figure 1, this “base material solution may include a material, which when converted into a non-solution state (***e.g., cured***), exhibits water-proof breathable properties.” (Ex. 1001, 3:38-40.) It is this “cured mixture” of base material with active particles embedded therein that the '287 specification refers to as a “membrane,” which may

be used as a laminate or as a “self supporting membrane” used independent of a substrate. (Ex. 1001, 2:13-15, 7:16-22, 9:14-18.)

22. The specific embodiments discussed in the preceding paragraph describe a “water-proof composition” comprising a cured base material and active particles in a *single layer*. In these embodiments, the active particles are “in contact with” the cured base material because they are incorporated into the base material and are physically touching that material, e.g., throughout its entire volume. As I understand from counsel, a claim interpretation that excludes preferred embodiments from a claim is rarely if ever correct, and would require highly persuasive evidentiary support. In my opinion, a POSITA would not identify any basis, much less any highly persuasive support, for excluding these specifically described and exemplified *single layer* embodiments from the scope of claim 27.

23. The prosecution history of the '287 patent further supports my opinion on this matter. For example, when attempting to distinguish claim 27 (then claim 28) over the *Spijkers* and *Haggquist* references, the Patent Owner specifically relied upon Example 1 of the '287 patent, and explained how the active particles are “used in such a membrane” and “in a membrane,” i.e. incorporated into a membrane having a “first thickness.” Specifically, the Patent Owner argued:

Applicant has amended independent claims 1, 28, 63 and 68 to include the claim features that the cured base material solution comprises a first thickness and the plurality of active particles comprises a second thickness,

with the first thickness being less than an order of magnitude larger than the second thickness. Support for these claim amendments may be found at, for example, Paragraph 0049, which states that the *Example 1 membrane comprises a thickness of about 1 mil, or about 25.4 microns (the first thickness)* and Paragraph 0050, which states that the *activated carbon used in such a membrane comprises Asbury5564™ powdered coconut activated carbon ... particle size ... [of] about 10 microns (the second thickness)* ...

[N]either Haggquist nor Spijkers discloses or alludes to using an active particle *in a membrane* where the membrane comprises a thickness that is less than an order of magnitude larger than the active particles.

(Ex. 1007, 17-18 (emphasis added).) In view of the above arguments, a POSITA would immediately appreciate that the active particles called for in claim 27 are “in contact with” the “cured base material comprising a first thickness,” because they are included within (i.e., “used in”) and at least partially surrounded by the membrane. Indeed, the cured base material membranes prepared in Example 1 - and relied upon by Patent Owner to distinguish the claims over the prior art - were made *by suspending activated carbon in a polyurethane solution* and then *curing the mixture* in an oven. (Ex. 1001, 8:54-61, 9:14-18, 28-31.) Patent Owner’s proposed construction seeks to remove these Example 1 embodiments from the scope of claim 27.

24. I further note that the Patent Owner’s interpretation of claim 27 as a two-layer composition relies upon a characterization of the “cured base material” as the “substrate” upon which the plurality of active particles are applied. (Paper 20 at

15-16 *citing* Ex. 1001, FIG. 1, 2:12-15, 42-46.) And while I appreciate that the “substrate” described in the ’287 patent may be a “PTFE substrate, polyurethane substrate, or knit material” (Ex. 1001, 2:43-46), the ’287 specification never describes or implies that this “substrate” is itself a “cured base material” that arises from a base material solution containing no active particles that is converted into a non-solution state by curing. In my opinion, the fact that polyurethane was included within a list of woven and non-woven substrates does not tell a POSITA that the “substrate” is the “liquid impermeable breathable cured base material” called for by claim 27. Instead, a POSITA would appreciate that the “substrate” described in the ’287 specification is a separate and distinct component that *may* or *may not* be included into the water-proof composition of claim 27 comprising the cured base material and the plurality of active particles. (*See e.g.*, Ex. 1001, FIG. 1, 7:10-15 (a substrate may be a substance for which the cured mixture of [base material and active particles] is intended to be permanently affixed ...).) A “substrate” is an *optional* component of the claimed invention. It is not expressly called for by the composition of claim 27, and there is no basis in the ’287 specification to equate it with the claimed “cured base material.”

25. In my opinion, since a “substrate” is not recited in claim 27, the claim must read on the single-layer self-supporting membrane embodiments discussed above. (*supra*, ¶¶21-22.) In contrast, claim 50 is specifically directed to a membrane

comprising a cured base material and a plurality of active particles “adapted for application to a substrate.” (Ex. 1001, 10:30-53, 14:9-14.) Thus, the language of the ’287 patent claims further establishes to a POSITA that the “substrate” described in the ’287 specification is distinct from the “cured base material” called for by the challenged claims. Notably, neither of Patent Owner’s experts could identify where the specification identifies the alleged two-layer structure as claimed in the 2.5/1 to 10/1 ratio of first thickness to second thickness. (Ex. 1047, 182:16 -183:3; Ex. 1048, 97:11-16 & 107:4 – 109:3).

26. In sum, the position of Patent Owner and its experts that the water-proof composition of claim 27 must be a two-layer composition is clearly incorrect. Patent Owner ignores (and excludes) preferred and exemplary embodiments from the ’287 specification directed to single-layer compositions where active particles are incorporated into the cured base material (e.g., self-supporting membranes) -- embodiments that the Patent Owner specifically relied upon to overcome prior art rejections during prosecution. Moreover, while the ’287 specification describes compositions where a cured base material (containing active particles) is applied to a “substrate” such as a “woven, non-woven, paper or knitted material” (Ex. 1001, 7:10-21), the Patent Owner’s two-layer theory inappropriately conflates this “substrate” with a “base material” that is cured from solution. Simply put, the ’287 specification does not support that the “substrate” upon which a base material may

be applied constitutes the “cured base material” itself. Patent Owner’s misinterpretation of the claimed composition essentially reads embodiments into claim 27 that are not even described in the ’287 patent and, therefore, were not in the possession of the inventor.

27. As stated above, the Patent Owner continues to advocate that the “first thickness” is a “first layer or membrane.” In my opinion, a POSITA would disagree that a term directed to a dimension (i.e., a “thickness”) of a material should be construed to define the structural nature of the material itself. A “thickness” does not refer to a cured base material “layer” and it does not refer to a cured base material “membrane.” Instead, as the Board has correctly noted, the “first thickness” is simply the “the thickness of a base material, which base material may include active particles.” (Paper 14 at 12.) Indeed, the Board’s construction aligns with the arguments made during prosecution in support of the “first thickness” limitation, when the Patent Owner explained that the membrane of Example 1 “comprises a thickness of about 1 mil ... (the first thickness)” which includes the Asbury 5564™ powdered coconut activated carbon “*used in* such a membrane.” (Ex. 1007, 17.) The “first thickness” is a physical dimension of the cured base material (which includes the active particles). It is not a “layer” or a “membrane,” and the fact that the cured base material “compris[es] a first thickness” does not *per*

se imply the presence of a “first layer or membrane” to which the active particles are applied.

28. I disagree with Patent Owner’s argument that its “interpretation ... is also consistent with the *Haggquist* application (Ex. 1004),” which is said to describe “active particles [that] can be permanently attached to [an] embedding substance through application of a binding agent” and a “xerographic method for treating an embedding substance.” (Paper 20 at 16-17.) While I appreciate that *Haggquist* was incorporated by reference into the ’287 patent, I do not see the relevance of these excerpts to the specifically claimed invention here. Indeed, the Patent Owner even attempted to distinguish the ’287 claims over *Haggquist* during prosecution, stating that “Haggquist fails to disclose a liquid-impermeable breathable cured base material” and that “Haggquist’s disclosure of yarns, fibers and the like generally refers to knits and wovens, which operate differently than the current specification’s disclosure of membranes.” (Ex. 1013, 12, 17.) For at least these reasons, a POSITA would not read the above disclosures from *Haggquist* to support any construction of the “thickness” of the cured base material called for by claim 27.

29. Finally, contrary to Patent Owner’s argument, I never “admitted” that the “‘cured base material’ is a substrate to which the active particles are applied.” (Paper 20 at 18 *citing* Ex. 1005, ¶93.) In the claim construction section from my

First Declaration, I stated that a “**cured base material**” ... “means a non-solution form of a substrate that was converted from a solution state via any conventional curing technique[,]” which would “[include] a dried and heated polyurethane solution.” (Ex. 1005, ¶93) The full context of my statement bears no relation to Patent Owner’s proposition that the claimed “cured base material” is a substrate upon which the active particles are applied. Indeed, my First Declaration only discusses cured base materials that contain active particles, because that is what the ’287 specification specifically describes and exemplifies. Furthermore, when using the word “substrate” in the above quote, I was not referring to the specific “substrate” described in the ’287 specification (as discussed above), but as a general term to describe a *material* or *mixture* in non-solution form that is obtained through curing. Indeed, the passages from the ’287 specification relied upon to support my claim construction refer to a “*material*, which when converted into a non-solution state (e.g., cured), exhibits water-proof breathable properties” and a “*mixture*” of active particles and base solution that is “cured or ... converted by other suitable means into a non-solution form.” (Ex. 1005, ¶93, *citing* Ex. 1001, 3:38-40, 7:10-33 (emphasis added).)

3. “Second Thickness”

30. The Board construed “second thickness” as “‘the thickness of a plurality of active particles,’ which may be the particle size of the active particles.”

(Paper 14 at 13.) The Patent Owner has contested the Board's construction, asserting that the "second thickness" is a "second layer or membrane," being in contact with the first thickness (i.e., the "first layer or membrane"). (Paper 20 at 19.) I do not agree with Patent Owner's position, and it is my opinion that a POSITA would not interpret the "second thickness" in this way. And while the Board adopted a slightly different definition for "second thickness" than offered in my First Declaration (Ex. 1005, ¶102 (the "particle size of the active particles")), it is my opinion that the Board's initial construction is better aligned with the term's broadest reasonable interpretation than Patent Owner's proposal here.

31. As discussed in the preceding section, a POSITA would not interpret the term "thickness" to express or imply any "layer or membrane." As such, I disagree with the Patent Owner that the "second thickness" defines a plurality of active particles as a "layer" or a plurality of active particles as a "membrane," which layer or membrane is distinct from (and applied to) a first layer or membrane. (Paper 20 at 19.) As discussed above, claim 27 of the '287 patent is neither directed to nor limited to the two-layer waterproof composition advocated by the Patent Owner here. (*supra*, ¶¶19-23, 27.)

32. I further disagree with Patent Owner's statement that "[c]laim 27 clearly states that the plurality of active particles ... forms a second layer which is the second thickness." (Paper 20 at 19-20.) Claim 27 makes no mention of layers,

much less any “second layer” formed by a plurality of active particles. Instead, the claim specifically calls for a water-proof composition comprising, among other things, “a plurality of active particles in contact with the liquid-impermeable breathable cured base material, the plurality of active particles comprising a second thickness.” (Ex. 1001, 12:1-7.) A POSITA would not read this language – taken in view of the ’287 specification (or file history) – to express or imply a “second layer added on top of the cured base layer.” (Paper 20 at 20.)

33. According to Patent Owner’s expert Stephen Callan, a POSITA “would not understand [the patent] to indicate that the second thickness is the ‘particle size of the active particles’ or even understand what that means.” (Ex. 2005. ¶47). I disagree. For one, as discussed in my First Declaration, the ’287 specification does not define or otherwise refer to a “second thickness,” and sheds no specific light on its meaning. (Ex. 1005, ¶101.) Nonetheless, a POSITA would know exactly what “second thickness” means because the Patent Owner defined the term during prosecution. (*Id.*) Specifically, Patent Owner equated this terminology with the particle size of the active particles contained in the cured polyurethane membranes prepared by Example 1 (i.e., the “Asbury 5564™ powdered coconut activated carbon” particles) that were said to “comprise [a particle size of] about 10 microns (the second thickness).” (Ex. 1005. ¶¶90, 102 *citing* Ex. 1007, 17.) And while I appreciate Mr. Callan’s comment that a POSITA may often use the term

“diameter” to refer to particle size (Ex. 2005, ¶47), that is not the language the Patent Owner chose to characterize the plurality of active particles. Rather, the Patent Owner decided upon “second thickness,” and used the particle size of Asbury 5564™ powdered coconut activated carbon (i.e., 10 microns) as the only means to support that terminology.

34. Moreover, when distinguishing the ’287 claims over the prior art, the Patent Owner specifically argued the following:

[N]either Spijkers nor Haggquist, together or individually, disclose or allude to a membrane having a first thickness and ***an active particle having a second thickness*** with the first thickness being less than an order of magnitude larger than the second thickness. ... Spijkers discloses using ***carbon particles with an average size of about 5 to 40 nm*** ... in a membrane having a thickness of about 5-50 microns. ... Although Haggquist discloses a ***larger active particle size of less than 10 microns***, neither Haggquist nor Spijkers discloses or alludes to using an active particle in a membrane where the ***membrane comprises a thickness that is less than an order of magnitude larger than the active particles***. The Spijkers reference discloses the use of a ***much thicker membrane than the incorporated particles*** and the Haggquist reference discloses an ***active particle having a size which is an order of magnitude greater than the particle size disclose[d] in Spijkers***. ... Applicant submits that a Spijkers membrane having an ***order or magnitude thickness greater than the Haggquist particles*** would be used with the Haggquist particles.

(Ex. 1007, 18 (emphasis added).) As shown in the above except, in each instance when the Patent Owner attempted to distinguish the ’287 claims over *Spijkers* and *Haggquist*, it referred to the “first thickness” as the thickness dimension of a membrane (containing the active particles), but defined the “second thickness”

based only on the size of the active particles, i.e., 5 to 40 nm in *Spijkers* and less than 10 microns in *Haggquist*. It is my opinion, based on this evidence, that the Patent Owner made a clear and unmistakable decision to define “second thickness” as the size (i.e., the diameter) of the active particles incorporated into a cured base material, and specifically used this particle size – instead of a dimensional thickness of some layer of active particles – to show written description support for the ratio of the “first thickness” to the “second thickness” (i.e., “at least two times larger ... but less than an order of magnitude larger”). (*See also* Ex. 1019, 17 (claims are directed to a specific thickness ratio of the first thickness being about 2.5 times the second thickness).)

35. Finally, I disagree with Patent Owner that construing a “second thickness” based on particle size removes the word “plurality” from the claim. (Paper 20 at 23.) I understand that the term “comprising” in the claim is open-ended and means “including” but not “excluding.” With that in mind, the plurality of active particles does, in fact, comprise or include a second thickness based on particle size. This construction is also consistent with Mr. Callan’s deposition testimony where he repeatedly equated activated particle size with the “second thickness” in order to provide support for the claimed 2.5/1 to 10/1 ratio of first

thickness to second thickness. (Ex. 1048, 81:8-13; 82:18 – 83:4; 85:6-17; 90:5-91:10; 92:9-93:8).⁴

36. This construction also provides the only support in the specification for the claimed ratio of first to second thickness because it is unlikely that the 10 micron diameter Asbury 5564™ active particles could be laid down in a perfect monolayer on the one mil (25.4 micron) polyurethane base material, but would tend to cluster (Ex. 1047, 114:16 – 120:13; Ex. 1048, 89:15-20) and distribute themselves throughout the film (Ex. 1048, 109:19-20). In other words, if the tendency of the active particles is to cluster, it is unlikely that the disclosed 10 micron active particles could be laid down on a 25.4 micron base material in a way that would meet the 2.5/1 to 10/1 ratio of first thickness to second thickness. However, if “second thickness” means or includes particle size, the claimed ratio is met and supported.

37. In sum, a POSITA would recognize that the Patent Owner characterized the “first thickness” and “second thickness” in different ways, with the “second thickness” defined by the diameter of the active particles, and that the

⁴ I disagree with Mr. Callan’s statements that my opinion on the meaning of “second thickness” is “ridiculous,” that I misrepresented information, that I misled the Board, and that the Board is “wrong.” (Ex. 1048, p. 109:7 – 113:4). My opinions and the Board’s construction are based on the claims, specification, and prosecution history.

Patent Owner, as its own author, came up with its own definition in order to obtain allowance of its claims.

B. Reply to Patent Owner's Arguments on Dutta (Ground 1)

38. I understand that the Patent Owner has alleged a number of deficiencies in *Dutta* (Ex. 1002) - a publication relied upon in my First Declaration to establish anticipation of claims 27, 28, 30, 32 and 36-37. (Ex. 1005, *see* Sections VIII.A and XI.A, incorporated herein.) Specifically, the Patent Owner asserts that “Dutta does not disclose ‘active particles,’ a ‘first thickness’ and a ‘second thickness’ as those terms are properly construed.” (Paper 20 at 25.) After thorough consideration of the Patent Owner's arguments, it remains my opinion that the challenged claims addressed in my First Declaration are anticipated by *Dutta*. I reply to each of the alleged deficiencies of *Dutta* raised by the Patent Owner as follows.

1. *Dutta* discloses “active particles,” even under Patent Owner's proposed construction

39. I have fully considered Patent Owner's arguments that *Dutta* only “discloses the use of absorbent particles to achieve improved water vapor transmission” and that the “Petition does not assert that Dutta discloses ... the use of adsorptive particles.” (Paper 20 at 26.) I do not agree with this position, and it is my opinion that a POSITA would not interpret *Dutta*'s hydrophilic absorbent

particles as falling outside of the scope of the limitation “active particles,” even when applying Patent Owner’s improperly narrow construction.

40. First, I agree with Patent Owner’s experts that the Board’s construction of “active particles” could embrace absorptive particles. (Ex. 2005, ¶23; Ex. 2006, ¶64.) As explained above in Section V.A.1, particles are designated as “active” by virtue of imparting various enhanced properties to a membrane, and not based on any specific mechanism of adsorption. Indeed, the inventor included at least some absorptive particles within the listing of particles considered to be “active” (e.g., baking soda, cinoxate, zinc oxide, and silica gel). (*supra*, ¶¶13-14; Ex. 2006, ¶43 (silica gel is an absorbing substance).) Similarly, a POSITA would conclude that *Dutta* discloses using the claimed “active particles” to improve water vapor transmission, because *Dutta* discloses particles, such as Sephadex, that are “capable of swelling by absorbing a large volume of aqueous liquid and assuming the form of a gel,” so as to increase “WVTR through the non-porous film” (Paper 20 at 27 (*citing* Ex. 1002, 5:25-30, 9:15-18); *see also* Ex. 1005, ¶121.)

41. Moreover, as explained in my First Declaration, a POSITA would consider the *Dutta* particles “active” because they are “molecular filters,” a specifically identified type of active particle disclosed in the ’287 specification. (Ex. 1005, ¶¶119-120 (*citing* Ex. 1024, 1:66-68) (Sephadex is a known molecular filter); Ex. 1001, 4:22-27; *see also* Texter (Ex. 1049, 192 (1975) (describing Sephadex as a

molecular sieve).) Dr. Daniels acknowledges that Sephadex is a molecular filter, also known as a molecular sieve. (Ex. 1047, 58:24-59:10). So does Mr. Callan. (Ex. 1048, 171:6-14). I previously stated that Sephadex also adsorbs or trap substances, and therefore qualifies as an active particle under the Board's construction. (Ex. 1005, ¶122 *citing* Ex. 1023, 1286 and Ex. 1027, 7.) And Patent Owner's expert Mr. Callan admits that Sephadex traps water. (Ex. 1047, 157:5-8 (Q: "Well, sir, certainly, you'll agree with me that Sephadex traps water; correct? A: "Yes.")). For at least these reasons, a POSITA would conclude that *Dutta* discloses active particles under the Board's broadest reasonable interpretation.

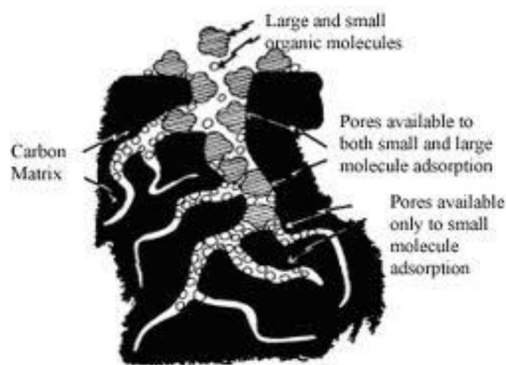
42. Furthermore, in my opinion from the perspective of a POSITA, *Dutta*'s hydrophilic particles also qualify as particles that "adsorb or trap substances on their surface" under Patent Owner's improperly narrow construction. Indeed, as already explained in my First Declaration, Sephadex particles are porous and have well-known applications as molecular sieves (they are "molecular filter type materials;" *see* Ex. 1001, 4:22-27) and are known to adsorb water. (Ex. 1005, ¶122 *citing* Ex. 1023, 1286 and Ex. 1027, 7.) Using Patent Owner's proposed definition, a POSITA would have further understood that Sephadex particles can "adsorb or trap substances on their surface" in view of *Pavia et al.* "Introduction to Organic Laboratory Techniques – A Microscale Approach" (Chapter 19) (1990), which describes gel chromatography as involving a "cross-linked polymeric material"

with a “sievelike structure” and a “porous structure,” that “Sephadex is one of the most popular materials for gel chromatography” and that the “hydroxyl groups *on the* [Sephadex] *polymer* can *adsorb water*.” (Ex. 1050, 717-18.) (emphasis added). *Pavia* thus describes an adsorption mechanism of action between water (which is a polar compound) and hydroxyl groups on the polymer surface of Sephadex.

43. *Texter* suggests the same mechanism of action between adsorbed water and Sephadex (“it is proposed that the *adsorbed water* molecules participate in two (or more) ‘hydrogen bonds’ (involving gel hydroxyl groups and/or ether linkages.”) (Ex. 1049, 206) (emphasis added). This mechanism of action is very similar, and perhaps identical to bonding occurring between polar compounds and the surface of admittedly active particles, such as alumina and silica gel. (Ex. 1050, 697-98 - suggesting that polar compounds bind to alumina and silica gel though dipole-dipole bonding, coordination, hydrogen bonding or salt formation.)

44. In his deposition, Dr. Daniels suggested a similar mechanism of action across several active particles, as well as Sephadex. (Ex. 1047, 37:3 – 39:1 (suggesting that mechanism of action between water and activated carbon, silica gel, zeolites, and Sephadex is hydrogen bonding); 88:22-89:22 (discussing hydrogen bonding between Sephadex and water in *Texter* article as the same as hydrogen bonding in silica gel)). Dr. Daniels agrees that the surface of Sephadex is both the “exterior and interior” and that water adheres to Sephadex by “start[ing] on

the outside and mov[ing] to the inside.” (Ex. 1047, 22:11-24). Whether the water binds to the outside edge or the inside surface of the particle makes little difference, as it is clear that activated carbon (admittedly an active particle) has pores in its surface that extend into the interior of the particle past its outer edge and participate in adsorption. Below is a picture of the surface of an activated carbon particle, which the inventor of the ’287 patent, Dr. Haggquist, describes as a “reasonable depiction” of activated carbon pores:



(Ex. 1053; Ex. 1046, 14:19-15:21). *Marenco* also describes Sephadex as having the ability to “*trap water* both *within* the bead, and *on the surface* of the bead in a microfilm.” (Ex. 1055, 59.) Accordingly, both Sephadex and activated carbon are comprised of material that binds water to its exterior and interior surfaces.

45. In view of the above references, and the above-cited deposition testimony from Patent Owner’s experts, which describe the physical properties of the Sephadex particles disclosed in Dutta, a POSITA would appreciate that those particles are molecular filter type materials that are also capable of adsorbing or

trapping substances (e.g., water) on their surface, for example, through hydrogen bonding of water with hydroxyl groups on the surface of the Sephadex polymer, which extends from the exterior to the interior of the particle. As such, the *Dutta* particles qualify as the “active particles” called for in the challenged claims, even under Patent Owner’s construction.

46. I further disagree with Dr. Daniels’ statement that the “hydrophilic absorptive materials [described in *Dutta*] ... are completely different from a particle adsorbing water into its pores and surface topology,” and Mr. Callan’s opinion that Sephadex “is not an adsorptive particle.” (Ex. 2006, ¶¶84-85; Ex. 2005, ¶¶65-66.)⁵ Dr. Daniels’ declaration describes some differences between absorption and adsorption. Against this backdrop, it is clear that Sephadex adsorbs water. First, Dr. Daniels says “[a]dsorption is a surface-based process wherein a film of adsorbate is created on the surface...” (Ex. 2006, ¶39). *Pavia* and *Texter* specifically state that Sephadex adsorbs water, and *Marenco* also describes water creating a film on the surface of Sephadex. (*supra*, ¶¶42-44.)

47. Next, Dr. Daniels says “an absorptive substance often has an infinite capacity for the substance absorbed.” (Ex. 2006, ¶40). Sephadex does not. Its

⁵ As to Dr. Callan’s statement that *Dutta* does not disclose particles that are “activated” (Ex. 2005, ¶74), I reiterate that “active” in the ’287 claims does not require that the particles be “treated to develop adsorptive properties. (*supra*, ¶16.)

“capacity for adsorption of water” is up to 20 ml/g, per *Sherma*. (Ex. 1023, 143).

Dr. Daniels says “[a]dsorption is always exothermic.” (Ex. 2006, ¶42). Sephadex adsorbs water in an exothermic process, per *Texter*. (Ex. 1049, 204 at Fig. 7). Dr. Daniels states that in absorption “[e]quilibrium is never reached, since there always exists a driving force for absorption. By contrast, adsorption reaches equilibrium.” (Ex. 2006, ¶42). Sephadex reaches equilibrium after it adsorbs water, as shown by the adsorption-desorption isotherm graphed by *Texter*. (Ex. 1049, 203 & Fig. 7; Ex. 1047, 42:7 – 44:9; 80:18 – 81:22; 83:11-19; 84:22-85:23).

48. Finally, Dr. Daniels states that “the active substance can be regenerated in its original particulate physical form” and “[a]n absorptive material will not be capable or regeneration to its original physical particulate form without a secondary step of size reduction (e.g. pulverizing) which has little change of producing its initial particle size.” (Ex. 2006, ¶ 47). Sephadex is readily regenerated to its original form through dehydration. (Ex. 1027, 31 (“once swollen it can be dried and returned to its original state...”).

49. And while I agree that *Dutta*’s particles swell in the presence of water, a POSITA would appreciate that water is also adsorbed onto the surface of the polymer matrix. According to *Pavia*, “the hydroxyl groups on the [Sephadex] polymer can **adsorb water**, which causes the material to swell” such that [a]s it expands, ‘holes’ are created in the matrix.” (Ex. 1050, 718 (emphasis added).)

Moreover, *Texter* published a study in 1975 on “[t]he state of adsorbed water in a dextran gel [Sephadex] ... by near-infrared and gravimetric-adsorption techniques” to determine, among other things, the functional groups of the saccharide monomer and cross linkages to which the adsorbed water molecules bind. (Ex. 1049, Abstract, 192.) *Texter* noted that the state of **adsorbed** water in the Sephadex gel “involves both water-gel skeleton and water-water interactions” and that “adsorbed water molecules participate in two (or more) ‘hydrogen bonds’ (involving gel hydroxyl groups and/or ether linkages).” (Ex. 1049, 204-206; *see also* *Marenco et al.* (Ex. 1055) at 59 (Sephadex beads swell and trap water both within the bead and on the surface of the beads).) Accordingly, a POSITA would have understood that Sephadex (as disclosed in *Dutta*), even if it swelled, to also be adsorbing water (i.e., adsorption to the hydroxyl groups and/or ether linkages exposed on the surface of the Sephadex gel). Regardless of the terminology employed by *Dutta* (i.e., hydrophilic absorbent particles), the swellable particles utilized therein would be covered under Patent Owner’s construction of “active particles” because they were known to adsorb water.

50. I further disagree with Patent Owner’s assertion that *Dutta*’s “hydrophilic particles swell and thereby stretch the membrane, creating holes or channels that allow water vapor to move across the membrane.” (Paper 20 at 28 *citing* Ex. 2005, ¶¶58-61 and Ex. 2006, ¶78.) For one, Patent Owner’s experts

provide no rationale to support this position. And Mr. Callan even acknowledges that “[t]he science behind [*Dutta*] is to alter the effective solubility of water vapor in the non-porous film by using highly water absorbent particles uniformly dispersed within the polymer film” (Ex. 2005, ¶60), which suggests a different mechanism than creating holes in a membrane. It is the increased water solubility conferred by the hydrophilic particles that improves the WVTR of *Dutta*’s membrane. (Ex. 1002, 5:36-38 (WVTR is directly proportional to film hydrophilicity); 9:2-5 (films with lower hydrophilicity have greater improvements in MVTR upon addition of the hydrophilic particles).) Moreover, *Dutta* expressly teaches against membranes having pinholes, microcracks and other defects, which will inappropriately lead to air permeation through the film. (Ex. 1002, 10:23-36.)

51. Finally, I note that Dr. Daniels has criticized *Dutta*’s use of ASTM E96 instead of ASTM F1249 for measuring MVTR, which he describes as a “preferred test for high sensitivity MVTR data.” (Ex. 2006, ¶85.) I do not find Dr. Daniels’ testimony compelling, at least because the ’287 patent also employs ASTM E96 to measure MVTR data. (Ex. 1001, 9:7-13.). In deposition, Dr. Daniels admitted that the ASTM E96 test used in *Dutta* is an “accepted method.” (Ex. 1047, 98:3-99:2)

52. In sum, *Dutta* teaches the “active particles” embraced by the ’287 patent claims regardless of the construction applied to a POSITA’s analysis. While

Dutta acknowledges that its particles are capable of trapping water by absorption, a POSITA would have appreciated that polymeric particles such as Sephadex are porous and have the ability to adsorb water and trap substances on its surface area (i.e., pore structure). Contrary to Dr. Daniels' assertions, absorption and adsorption are not "diametrically opposed scientific pathways and principles" (Ex. 2006, ¶106.) To be sure, each mechanism acts by trapping substances such as water within a material, and that is all that an "active particle" needs to do to "improve the moisture vapor transport capacity of the composition," as required by claim 27. A material's ability to swell does not tell a POSITA that adsorption mechanisms are excluded. As explained above, based on the undisputed scientific references in the prior art (*Sherma, Pavia, Texter, and Marengo*) swellable polymers such as Sephadex adsorb or trap water.

2. *Dutta* discloses the "first thickness" and "second thickness" even under Patent Owner's narrow construction

53. I have fully considered the Patent Owner's argument that "the Petition does not show how *Dutta* meets the 'first thickness' and the 'second thickness' elements of claim 27." (Ex. 2006, ¶86; *see also* Paper 20 at 29-30.) I do not agree with this position, and it is my opinion that a POSITA would not reach this conclusion under the Board's construction of these claim terms. Moreover, a POSITA would appreciate that *Dutta* discloses a two-layer composition having a

first thickness and a second thickness according to Patent Owner's narrow interpretation of the challenged claims.

54. I disagree with Patent Owner that anticipation of claim 27 requires a showing on "how *Dutta* discloses the 'thickness of the water-proof composition.'" (Paper 20 at 30.) It is not the "water-proof composition" that has a "first thickness" and a "second thickness." Indeed, the water-proof composition need only *comprise* a cured base material having a first thickness and a plurality of active particles having a second thickness. While I appreciate that the water proof-breathable composition may have its own thickness, which may e.g. include these first and second thickness of the membrane, along with the thickness of an unclaimed "substrate" (e.g., a nylon woven fabric as disclosed in Example 1 of the '287 patent; Ex. 1001, 8:54-61), that overall thickness is not a limitation of the claims.

55. Moreover, I disagree with Patent Owner's contention that Petitioner fails to show how the water-proof composition "includes the base material and the active particles." As explained in my First Declaration, *Dutta* discloses a film cast from a solution of hydrophilic polyurethane and cross-linked Sephadex particles, which was cured into a film providing an MVTR of 6730 g/m²/day, an improvement over the control. (Ex. 1005, ¶¶126-132.) A POSITA would appreciate that this film, along with other films disclosed in *Dutta*, contains all of the elements of the water-proof composition of claim 27, as construed by the Board, which is

uncontested. Patent Owner's position is entirely dependent on its "two-layer" construction, with which I disagree.

56. In any event, I further disagree that the "Petition fails to show (or even allege) that *Dutta* discloses the two-layer invention of claim 27." (Paper 20 at 31.) As discussed above, the challenged claims are not directed to or limited to a two-layer composition (*supra*, ¶¶19-26.) Nonetheless, my First Declaration acknowledges that "*Dutta* also discloses ... 'a layered arrangement of the polymer resin and the absorbent particles[, which] can be used to fabricate useful products.'" (Ex. 1005, ¶65; *see also* Petition, Paper 1 at 22, 34 *citing* Ex, 1002, 12:26-27 and 4:20-28.) According to *Dutta*, this alternative method for providing an increase in WVTR involves first forming a film of a polymer resin, and then "uniformly distributing" the absorbent particles "over the film while it is in a form capable of adhering to the particles." (Ex. 1002, 12:26-30.) This specific arrangement, which provides a two-layer material under the Patent Owner's overly narrow construction, is specifically exemplified in *Dutta* Example 6, as follows:

A laminate of PTFE and taffeta fabric similar to that used in Example 3 was used in this example. Using a 5 mil drawdown bar, **a continuous film was cast from the hydrophilic polyurethane prepolymer** of Example 4 on the microporous PTFE surface of the laminate. **On top of the cast polyurethane film, particles of an acrylic resin (Salsorb 88 from Allied Colloids Inc., water absorption capacity of about 496 gm/gm and particle size of 90 to 850 micrometers) were manually sprinkled in a uniform manner.** The entire package was then allowed to cure by reacting with ambient moisture. After

curing, the coated laminate was tested and the **average water vapor transmission rate** of three test areas within the sample **was 3076**.

(Ex. 1002, 22:4-16 (emphasis added).) This two-layer construction from *Dutta* provided a WVTR within the claimed range, which was an improvement over the control. (*See Id.* (A coated laminate was prepared using the procedure described in Example 6 except that no Salsorb 88 particles were sprinkled onto the cast polyurethane prepolymer film. The average water vapor transmission rate of three test areas within the coated laminate was 2064).). Given the range of particle sizes from 0.1 to 300 microns (Ex. 1002, 9:15-19), Dutta also discloses first and second thickness ratios within the 2.5/1 to 10/1 range required in claim 27.

57. Finally, I disagree that the Petitioner needed to show how *Dutta* disclosed a second layer, **distinct from the first**, comprised of a plurality of active particles. (Paper 20 at 31-32.) The claims do not require this, and instead allow for the active particles to be dispersed throughout the cured base material (*supra*, ¶¶20-22), as is disclosed in Example 1B of *Dutta* and elsewhere. (Ex. 1005, ¶¶114-117.) In addition, even if for the sake of argument, the claims required separate and distinct layers (which a POSITA would not understand from the challenged claims), *Dutta* also discloses these features, e.g., as shown above for Example 6 (a plurality of particles are added on top of a cured base material).

58. In view of the above discussion, it remains my opinion that *Dutta* anticipates the challenged claims, and does so even under the Patent Owner's erroneous construction of the "first thickness" and "second thickness" limitations.

C. Reply to Patent Owner's Arguments on *Dutta* and *Haggquist* (Ground 2)

59. I have fully considered the Patent Owner's argument that "a [POSITA] ... would not have been motivated to combine *Dutta* and *Haggquist*, and no such combination would have made the '287 patent obvious." (Paper 20 at 32.) I do not agree with this position, and it is my opinion that a POSITA would not reach this conclusion under the Board's construction of these claim terms. Moreover, because *Dutta* discloses a two-layer composition having a first thickness and a second thickness (*supra*, ¶56), a POSITA would have also found the challenged claims obvious under Patent Owner's inappropriate claim interpretations.

60. I disagree with Mr. Callan that a "[POSITA] would not substitute the [so-called] super-hydrophilic swelling particles in *Dutta* ... with 'inert' particles that *Dutta* ... [identifies] as not swelling." (Ex. 2005, ¶72 (emphasis original).) For one, *Dutta* and *Haggquist* do not disclose particles that "do exactly the opposite." (Paper 20 at 33.) Even if for the sake of argument, the precise mechanisms by which the *Dutta* and *Haggquist* particles operate is different (i.e., absorption vs. adsorption), a POSITA would have appreciated that both types of particles were

capable of adding moisture management characteristics to garments. (Ex. 1005, ¶¶147-150.) As explained in my First Declaration, the porous particles disclosed in *Dutta* and *Haggquist* were recognized to perform the same functions, and thus a POSITA would have found it obvious to substitute the admittedly active *Haggquist* particles for the *Dutta* Sephadex particles. (Ex. 1005, ¶150 (“whether acting through an adsorptive mechanism of action, or an absorptive mechanism of action, the porous, hydrophilic Sephadex particles physically react with and/or trap water ... which is the same function performed by the porous, activated particles disclosed in *Haggquist*.”))

61. I further disagree that a POSITA would be “led away from combining these [so-called] completely different sciences” as Mr. Callan submits. (Paper 20 at 32-34 (*citing* Ex. 2005, ¶72).) Though *Dutta* characterizes particles such as talc, silica, calcium carbonate, carbon black and titanium dioxide as “inert diluent particles” (Ex. 1002, 9-10), the reference does not state that they fail to trap substances such as water, or otherwise explain the meaning of the word “inert.” *Dutta* could have meant “chemically inert.” In this regard, activated carbon is likewise chemically inert. (Asbury SDS, Ex. 1056, 3.) Nor does *Dutta* discourage the POSITA from including these particles in the *Dutta* compositions. Quite the opposite. As *Dutta* explains, the polymer used to make the film may contain any of the above listed particles, along with other additives like UV stabilizers, antistatic

agents, and odor absorbing agents, all of which are active particles according to the '287 patent. (*Id.*; Ex. 1001, 3:61-4:27.)

62. While I stated during my deposition that “inert” could mean “not necessarily influencing the MVTR or WVTR,” this would not have discouraged the POSITA from replacing, e.g., the Sephadex particles of *Dutta* with the moisture managing “active particles” disclosed in *Haggquist*. In my opinion, a POSITA would have recognized the benefits of *Haggquist*’s “active particles” (such as activated carbon) for improving MVTR, because *Haggquist* itself states that these particles have moisture management properties and the ability to “adsorb or trap substances” such as water based upon their “multitude of pores.” (Ex. 1004, [0004]; Ex. 1005, ¶157.) As further explained in my First Declaration with respect to claims 38 and 39, a POSITA would have been motivated to successfully utilize the encapsulant systems disclosed in *Haggquist* with the active particles disclosed in *Dutta*, e.g., Sephadex particles, or to use *Haggquist*’s encapsulated active particles in place of the particles in *Dutta*, because the *Haggquist* encapsulant was known to protect the performance enhancing characteristics of active particles (including moisture management) from premature deactivation, and *Haggquist* teaches and suggests their application to molecular filter particles. (Ex. 1005, ¶¶154, 178, 180-183.) Contrary to Mr. Callan’s opinion, *Dutta* need not disclose the use of

encapsulated active particles for a POSITA to combine *Dutta* with *Haggquist*. (Ex. 2005, ¶82.) The relevant motivational teachings come from *Haggquist*.

63. I further disagree with Mr. Callan’s contention that adding the active particles of *Haggquist* to the *Dutta* membrane would increase thickness, which is said to be “discouraged” by *Dutta*. (Paper 20 at 34 *citing* Ex. 2005, ¶80.) Again, *Dutta* does not discourage the addition of such particles, but actually encourages it based on the express disclosure of adding particles such as silica and titanium dioxide (each of which constitute “active particles” according to *Haggquist*.) (Ex. 1002, 9-10.) Moreover, a combination of *Dutta* and *Haggquist* based on *replacing* the larger Sephadex particles (20 to 50 microns) with smaller “active particles” disclosed in *Haggquist* (about 10 microns) would not increase thickness of the *Dutta* films.

64. *Dutta* also does not discourage the combination of *Dutta* and *Haggquist* based any notion of “keeping the surface of the membrane smooth.” (Paper 20 at 34.) *Dutta* only suggests “at least one surface of the film be substantially smooth by being free of particles.” (Ex. 1002, 11:1-4.) As discussed above, *Dutta* also teaches embodiments where particles are uniformly added on top of a cured film, which would create a surface of the film that is rough. (*supra*, ¶56.)

65. In view of the above discussion, it remains my opinion that *Dutta* in view of *Haggquist* renders the challenged claims obvious, and does so even under

the Patent Owner's erroneous construction of the terms "active particles," "first thickness" and "second thickness."

D. Reply to Patent Owner's Arguments on *Halley* (Ground 3)

66. I understand that the Patent Owner has alleged a number of deficiencies in *Halley* (Ex. 1003) - a patent publication relied upon in my First Declaration to establish anticipation of claims 27, 28, 30, 32, 33 and 35-37. (Ex. 1005, *see* Sections VIII.B and XI.C, incorporated herein.) Specifically, the Patent Owner asserts that *Halley* does not disclose "active particles," or the "first thickness" and the "second thickness" called for by the claims. (Paper 20 at 36, 40.) After thorough consideration of the Patent Owner's arguments, it remains my opinion that the challenged claims addressed in my First Declaration are anticipated by *Halley*. I reply to each of the alleged deficiencies of *Halley* raised by the Patent Owner as follows.

1. *Halley* discloses "active particles" even under Patent Owner's proposed construction

67. I have fully considered Patent Owner's position that "[w]ithout a specific teaching of carbon that is activated to have adsorbent properties, *Halley* simply does not disclose the technology of the Patent – at least in the respect that the [Halley] carbon particles are not 'active particles' and there [sic, they] are not 'active particles that improve the moisture vapor transport capacity of the composition,' as required by Claim 27." (Paper 20 at 37.) I cannot agree with this

position, and it is my opinion that a POSITA would not interpret *Halley*'s Black Pearls 2000 carbon as falling outside the scope of the "active particles" limitation, even when applying Patent Owner's improperly narrow construction.

68. As explained in my First Declaration, *Halley* discloses that "a particulate solid is incorporated into the water-vapour permeable polymer, generally before the polymer coating is applied onto the substrate" and that the particulate solid is preferably carbon particles, but can be other particles such as "titanium dioxide, zinc oxide, aluminum oxide [and] silica." (Ex. 1005, ¶75; Ex. 1003, 3:1-7.) Thus, *Halley* specifically describes particulate solids that qualify as "active particles" according to the '287 specification. (See Ex. 1001, 4:22-27 (active particles may include aluminum oxide, silica gel, zinc oxide, titanium dioxide, and other suitable materials). In addition, those "active particles" are further in contact with the claimed cured base material, because *Halley* specifically discloses incorporating them into a polymer coating (e.g., a cured polyurethane base material). (Ex. 1005, ¶¶195, 201 *citing* Ex. 1003, 2:1-5, 3:1-7, 8:7-31.)

69. Regarding Patent Owner's position that Black Pearls 2000 is not an "activated carbon" since it has not been processed to have the porosity necessary for surface action" (Paper 20 at 36.), I reiterate that a POSITA would not interpret the term "active particles" as requiring an activation step, at least because the '287 specification discloses particles that trap water, odors and even light through

various absorption mechanisms. (*supra*, ¶16.) Active particles do not need to be subjected to an activation process to create a porous structure that confers adsorptive properties.

70. While the '287 patent does not specifically describe Black Pearls 2000 as an “active particle,” a POSITA would have recognized that Black Pearls 2000 carbon particles employed by *Halley* are “active” at least because they provided an improvement in MVTR when incorporated into a cured base material. This was explained in my First Declaration in view of Example 1, where different amounts of Black Pearls 2000 (0.3, 0.65 and 1.5 weight percent) were “intimately mixed” with polyurethane and coated onto a PTFE membrane. (Ex. 1005, ¶195, 203, 211; Ex. 1003, 7:17-23.) As provided in Table 3, each weight percent provided an improvement in MVTR compared with control. (*Id.*) A similar result is shown in Table 1 from *Halley* (below), which shows that MVTR is improved⁶ for each carbon-enhanced membrane. (Ex. 1003, 8.)

⁶ These MVTR results are outside the claimed range, but show an improvement nonetheless.

TABLE 1 (Membrane)

Sample	Particle % wt	MVTR (mean) g/m ² /d	Wash to leak	Abrasion to leak (cycles)	Handle (mean)
Control	-	13406			
1	0.3	17274			
2	0.65	14196			
3	1.5	16635			

In my opinion, a POSITA would have characterized Black Pearls 2000 as an “active particle” according to the ’287 patent because those particles are clearly trapping water within the *Halley* particle-containing membranes to provide an improved MVTR. Patent Owner’s citation to Table 2 of *Halley*, which describes the membranes from Table 1 further coated onto face fabric (Ex. 1003, 7:9-12, 8:11-15) and is alleged to show “a decrease in water vapor transmission rates with the addition of carbon black,” (Paper 20 at 39) does not negate the clearly recognizable improvements in MVTR by the membranes themselves.

71. Moreover, as further stated in my First Declaration, the carbon Black Pearls 2000 employed in the *Halley* examples was known to adsorb water. (Ex. 1005, ¶203 (*citing* Ex. 1028, 284).) Further to this point, *Wang et al.* “Micro-Porous Layer with Composite Carbon Black for PEM Fuel Cells” describes a micro-porous layer (MPL) containing carbon black that “provide[s] proper pore structure ... to allow a better gas transport and water removal from [a] catalyst layer.” (Ex. 1051,

4909.) Black Pearls 2000 were analyzed in *Wang*, and shown to have a surface area of 1501.8 m²/g and a pore volume of 2.67 cm³/g, which reveals a “larger pore volume as compared to Acetylene Black, from which we can deduce that the MPL made of Black Pearls 2000 involves *more micro-pores* than that of acetylene black.” (Ex. 1051, 4911.) *Wang* also notes that this increased porosity creates a “***high surface area and capability to adsorb water*** ... relative to Acetylene Black. (Ex. 1051, 4911.) Thus, a POSITA would have appreciated at the time the ’287 patent was filed, that the Black Pearls 2000 were porous particles with a large surface area and an adsorptive capacity for water. (See Ex. 2006, ¶43 ([a]dsorption requires a material that has a large surface area in the form of pores). *Halley’s* Black Pearls 2000 are therefore embraced by the ’287 claims even under Patent Owner’s overly narrow interpretation of “active particles.”

72. I further disagree with Patent Owner’s position that *Halley’s* “water vapor transmission ... is accomplished by [a] hydrophilic film through the process of absorption – not through any active (i.e., adsorptive) particles” and Mr. Callan’s argument that *Halley* requires the use of “solely absorptive particles” and specifically bans the use of “active particles.” (Paper 20 at 38-39 *citing* Ex. 2005, ¶94.) Patent Owner supports its position with reference to the hydrophilic films disclosed in U.S. 4,194,041, which “transfer substantial amounts of water through the film by absorbing water.” (Paper 20 at 38 *citing* Ex. 1025, 3:22-56.) However,

these polymeric films from the '041 patent do not include any of the “active particles” disclosed by *Halley* and incorporated into the *Halley* films (e.g., Black Pearls 2000 in Example 1). Instead, Patent Owner’s citations to the '041 patent refer to the absorptive properties of the polymeric film itself (e.g., polyurethane), which was known to be the mechanism by which water is transported across the polymeric film. In my opinion, the '041 description relied upon by Patent Owner does not support that the particulate solids incorporated into the *Halley* films must act solely by absorption.

2. *Halley* discloses the “first thickness” and “second thickness”

73. I disagree with Patent Owner that anticipation of claim 27 requires showing “how *Halley* discloses the ‘thickness of the water-proof composition.’” (Paper 20 at 40.) As stated above, it is not the “water-proof composition” that has a “first thickness” or a “second thickness.” The water-proof composition need only *comprise* (an open claim term) a cured base material having a first thickness and a plurality of active particles having a second thickness. Moreover, I disagree with Patent Owner’s contention that Petitioner fails to show how the water-proof composition “includes the base material and the active particles.” (Paper 20 at 40.) As explained in my First Declaration, *Halley* discloses polyurethane films containing particulate solids such as Black Pearls 2000, which are cured into a membrane and optionally applied to a fabric substrate. (Ex. 1005, ¶¶195-198, 201,

211.) A POSITA would appreciate that these films or membranes from *Halley* meet each and every limitation required of the water-proof composition of claim 27, as construed by the Board, which is uncontested. Patent Owner's position depends on a "two-layer" construction with which I disagree.

74. I further disagree that the "Petition fails to show how the 'first thickness' element, as construed by the Board, is met by Halley[.]" because "the Petition fails to show (or even allege) that Halley discloses the two-layer invention of claim 27." (Paper 20 at 41.) As discussed above in Section V.A.2-3, a POSITA would not construe the terms "first thickness" and "second thickness" as separate and distinct "layers" or "membranes" (*supra*, ¶¶27-34). As construed by the Board, the challenged claims most certainly embrace single-layer compositions where active particles are incorporated into a cured base material, such as those described in the '287 patent itself (*see e.g.*, discussion on Example 1 above at ¶¶20-21), as well as those described and exemplified in Halley such as those containing Black Pearls 2000 (*supra*, ¶¶70-71).

75. In view of the above discussion, it remains my opinion that *Halley* anticipates the challenged claims.

E. Reply to Patent Owner’s Arguments on *Halley* and *Haggquist* (Ground 4)

76. I have fully considered the Patent Owner’s argument that “a [POSITA] ... would not have been motivated to combine *Halley* and *Haggquist*, and no such combination would have made the ’287 patent obvious.” (Paper 20 at 42.) I cannot agree with this position, and it is my opinion that a POSITA would not reach this conclusion under the Board’s construction of these claim terms.

77. I disagree with Mr. Callan that “*Halley* requires the use of ‘solely absorptive particles’ and *Haggquist* requires use of “‘active particles’ specifically banned by *Halley* science.” (Paper 20 at 42, 45-46 *citing* Ex. 2005, ¶¶93-94, 96; Ex. 2006, ¶106.) The admittedly “active particles” disclosed in *Haggquist*, which include aluminum oxide, silica, zinc oxide and titanium oxide (Ex. 1004, [0030]) are suggested as alternatives to the carbon particles for use in the water-vapor permeable films of *Halley*. (Ex. 1003, 3:1-7.) And contrary to Dr. Daniels’ assertions (Paper 20 at 43 *citing* Ex. 2006, ¶¶98, 102, 107), the Black Pearls 2000 specifically incorporated into *Halley*’s polymeric films in its examples, *did* lead to an increase in WVTR (*supra*, ¶70, *citing* Ex. 1003, Tables 1 and 3.) Even if for the sake of argument, these Black Pearls 2000 were not “activated” to “create” pores capable of adsorbing water, it is my opinion that they constitute “active particles” (even under Patent Owner’s narrow construction), because they were known to

adsorb water into their porous structure. (*supra*, ¶71 citing *Wang* Ex. 1051, 4909, 4911.)

78. Contrary to Patent Owner's assertions, the particulate solids taught in *Halley* are not "'inert' insofar as water vapor transmission is concerned." (Paper 20 at 44 (citing Ex. 2006, ¶¶100-101).) Quite the opposite. A POSITA would have recognized that the *Halley* particles are capable of trapping water (and even adsorbing water at their surfaces) for the purpose of improving WVTR in a cured polymeric film. Further, with respect to claims 38 and 39, and as explained in my First Declaration, a POSITA would have been motivated, for example, to utilize the encapsulant systems disclosed in *Haggquist* with the active particulate solids disclosed in *Halley*, e.g., Black Pearls 2000, because the *Haggquist* encapsulant was known to protect the performance enhancing characteristics of active particles from deactivation. (Ex. 1005, ¶227.) And since at least Black Pearls 2000 were known to be a porous substance capable of adsorbing water, a POSITA would have been motivated to encapsulate them for the benefits disclosed in *Haggquist*.

79. Finally, I disagree with Patent Owner that the data from *Halley* "Table 1 and Table 2 cannot be used because the 'claim is from 600 g/m²/day to 11,000 g/m²/day.'" (Paper 20, 44.) I did not rely on those Tables in my First Declaration. However, a POSITA would have appreciated from Tables 1 and 2 that Black Pearls 2000 was an "active particle" that would have led to an improvement in WVTR

when incorporated into a cured base material according to claim 27. In my opinion, Black Pearls 2000 could have been easily and routinely used to achieve a water-proof composition having a WVTR falling within the range recited in the claims. In any event, Table 3, which I relied on in my First Declaration, shows results within the claimed WVTR range.

80. In view of the above discussion, it remains my opinion that the combination of *Halley* and *Haggquist* renders the claims 38 and 39 obvious.

VI. REPLY TO PATENT OWNER'S SECONDARY CONSIDERATIONS

81. I understand Patent Owner has contended that secondary considerations of non-obviousness should be considered in evaluating the validity of the '287 Patent. Paper 20 at 46-51. For such evidence to be considered, I understand from counsel that there must be a "nexus" or correspondence between the evidence of secondary considerations and the patented invention. That is, I understand that the asserted objective evidence of non-obviousness must be tied to a specific product, and that the product must embody the invention disclosed and claimed in the patent. Moreover, I understand that the commercial success of the product must derive from the claimed invention and be attributable to something disclosed in the patent that was not readily available in the prior art.

82. I have evaluated Dr. Daniels' analysis of two alleged samples, identified as "TNF Laminate Our Print" and "TNF Jacket," and I find little if any

connection between the analyzed samples and the claims of the '287 Patent. In fact, Dr. Daniels does not even attempt to evaluate or measure key limitations of the challenged claims. Additionally, it is my opinion that the testing protocols used by Dr. Daniels are neither appropriate nor sufficient to support a number of his alleged conclusions.

83. As I iterated above, the “water-proof composition” (product) of claim 27 of the '287 Patent requires, at least:

- a liquid-impermeable breathable cured base material comprising a first thickness;
- a plurality of active particles in contact with the liquid-impermeable breathable cured base material, the plurality of active particles comprising a second thickness; and

wherein,

- the first thickness comprises a thickness at least 2.5 times larger than the second thickness but less than an order of magnitude larger than the second thickness,
- the active particles improve the moisture vapor transport capacity of the composition, and
- a moisture vapor transmission rate of the water-proof composition comprises from about 600 g/m²/day to about 11000 g/m²/day.

84. Furthermore, at least the following limitations of claim 27 were added during prosecution (between June 4, 2013, and October 25, 2013) and ultimately

resulted in a Notice of Allowance for the application issuing as the '287 Patent
(additions shown by underscore):

- a liquid-impermeable breathable cured base material
comprising a first thickness;
- a plurality of active particles in contact with the liquid-impermeable breathable cured base material, the plurality of active particles comprising a second thickness; and

wherein,

- the first thickness comprises a thickness at least 2.5 times larger than the second thickness but less than an order of magnitude larger than the second thickness

See Ex. 1007, at 6-7; Ex. 1019, at 6-7; Ex. 1020, Ex. 1021, 7. Dr. Daniels does not evaluate or measure any thickness of any layer of the samples; nor does Dr. Daniels evaluate any ratio between thicknesses; nor did he evaluate any improved MVTR. (Ex. 1047, 194:8-196:1; 204:15-25).

85. With respect to the “infringement chart” from the litigation, Dr. Daniels only provides a hand waving analysis that merely indicates he agrees with it. (Ex. 2006, ¶¶125-126) In deposition, however, he admitted that Cocona’s “infringement” analysis does not demonstrate how any particles in the DryVent™ 2.5L product are “active”; that picking a single thickness (rather than averaging multiple measurements) to establish thickness is not representative (which is what Cocona did); and that there was no data showing an improved MVTR over a control, which “should” have been done. (Ex. 1047, 212:20-215:8.)

86. First, I will comment on Dr. Daniels' numerous assumptions and conclusory statements on the origin of each of the tested samples. I will then evaluate Dr. Daniels' testing protocols and his corresponding results and conclusions. Finally, I will identify how the samples fail to embody any claimed composition of claim 27.

A. There is No Evidence Supporting the Origin of the Samples

87. As an initial matter, I note that Dr. Daniels has provided no evidence whatsoever with regard to the origin or preparation of the tested samples. For instance, with reference to the "TNF Laminate Our Print" ("first sample"), Dr. Daniels states, "I am told this is a product made by Cocona as one of the first prototypes of the '287 patented technology and was shown to TNF in connection with business discussions with TNF." Ex. 2006, ¶ 112 (citing Ex. 2011, ¶ 19). The Declaration of Dr. Haggquist, upon which Dr. Daniels relies, merely states:

- "After the application for the '287 Patent was filed and product practicing claim 27 was made, Cocona shared the novel features of the '287 Patent with TNF. We showed TNF the first functional print on a membrane that overcomes thickness issues and increases the performance of the membrane." (Ex. 2011, at ¶ 14.)
- "TNF loved the product, and agreed to license Cocona's technology, which matured into the '287 Patent . . . [and] TNF launched the FlashDry brand in 2011." (*Id.* at ¶ 16.)
- "I provided a sample of an early prototype 2.5L fabric to Cocona's expert in this case, Charles Daniels, labeled 'TNF Laminate Our Print.' This sample was made according to claim

27 with a cured base material of polyurethane polymer and with an applied print layer made of activated carbon and a volcanic mineral (zeolite), and which was made to meet the thickness ratio and MVTR range of claim 27.” (*Id.* at ¶ 19).

88. While I understand that Dr. Daniels was “told” that the first sample was “made by Cocona as one of the first prototypes” and “shown to TNF,” I find grave deficiencies in the declarations of both Drs. Daniels and Haggquist with respect to the origin of the first sample. To ensure that the first sample was indeed “one of the first prototypes of the ‘287 patented technology” and was the sample “shown to TNF,” I would expect at a minimum some evidence authenticating the first sample, including items such as:

- Dated lab notebooks chronicling the synthesis of the first prototypes, including the first sample;
- Results of testing and analysis of the first sample at the time of synthesis that evidences, at least, the claimed first and second thicknesses and the ratio between thicknesses;
- An identifier (or other cataloging) corresponding to the first sample that identifies it as “one of the first prototypes”;
- Evidence of the date/time of the alleged meeting with TNF;
- Evidence that the first sample allegedly shown to TNF was thereafter stored and catalogued according to customary protocols; and
- Evidence that the sample retrieved from storage and provided to Dr. Daniels was the first sample shown to TNF.

89. With respect to the “TNF Jacket” (“second sample”), Dr. Daniels does not indicate how the sample was obtained; however, the declaration of Dr. Haggquist states: “I also provided a sample to Charles Daniels labeled ‘TNF Jacket.’ This sample was made according to claim 27 with a cured base material of polyurethane polymer and with an applied print layer made of activated carbon and a volcanic mineral (zeolite), and which was made to meet the thickness ratio and MVTR range of claim 27.” Ex. 2011, at ¶ 20. Here again, I would expect to see evidence that the second sample “was made according to claim 27,” rather than a mere conclusory and cursory statement to that effect. In addition to the items listed above, I would expect to see evidence regarding when the second sample was made, whether the second sample was made for sale or in preparation for litigation, whether the second sample was made by Cocona’s manufacturer or a laboratory, or similar evidence authenticating the second sample.

90. In sum, the complete lack of evidence regarding the origin of each of the first and second samples casts doubt over both the results of testing and the conclusions provided by Dr. Daniels.

B. Dr. Daniels failed to Conduct Appropriate Tests to Support His Conclusions

91. Dr. Daniels evaluated the first sample under various magnifications using optical microscopy and scanning electron microscopy (SEM). Ex. 2006 at ¶¶

112-113, 115-116. Based on microscopy of the first sample, Dr. Daniels formed a number of conclusions that are unsupported by the evidence provided. I will take up each of these faulty conclusions in turn.

92. For example, with reference to Figure 1, Dr. Daniels states, “This is a high magnification optical micrograph of the TNF Laminate Our Print sample, which shows a print layer (shown as the pattern of black dots) on top of a *cured* based [sic] material.” Ex. 2006 at ¶ 113 (emphasis added). While the optical micrograph of Figure 1 illustrates a pattern of black dots on a lighter-colored material, there is absolutely no evidence whatsoever based on the micrograph that the lighter-colored material is “cured,” as opposed to extruded, for example. Without evidence of the preparation of the first sample, any conclusion based on microscopy that the lighter-colored material was “cured” is misplaced.

93. Based on an SEM image of the first sample, Dr. Daniels states, “I was able to see the particles of the pattern from the active layer (the print layer) on the fabric piece. What is visible is a large number of porous particles, many of which are grouped together in the square dot. Pores appear as the holes in the particles.” Ex. 2006, at ¶ 115. I disagree. The SEM images do not reveal what portions of the observed features are particles, polymeric binder, particles coated with binder (or any other constituents of the particle containing coating used for printing), holes

between particles, or pores. Thus, as a POSITA who routinely evaluates SEM images, I cannot confirm that the particles are porous based on Dr. Daniels' work.

94. Based on a number of lower magnification SEM images of the first sample, Dr. Daniels states, "low-magnification photos from the SEM experiment (x500, x200, x 50, and x20 magnification, respectively) show[] the raised features of small dots against a smoother layer directly beneath. ***This is strong evidence of a layer of active particles on top of a layer of cured base material.***" Ex. 2006 at ¶ 116 (emphasis added). Again, I disagree. At most, the SEM images illustrate raised features of a material. There is absolutely no evidence from the SEM image that the raised features are a layer of "active" particles on top of a separate layer of "cured" base material. Here again, Dr. Daniels based his conclusions on inadequate testing and evidence. Indeed, Dr. Daniels neither tested the activity of the particles (e.g., by conducting an MVTR evaluation with and without the raised features), nor provided any evidence that the "smoother" material was "cured."

95. Further based on the lower magnification SEM images, Dr. Daniels states, "the TNF Laminate Our Print sample had two distinct layers, each having its own thickness." Ex. 2006 at ¶ 117. First, from the SEM images, there is no evidence that the "raised features" are a distinct layer on top of another layer of material. That is, there is no indication that the layers have a different composition based on the SEM images. These images do not preclude alternate production

strategies such as pressing or molding raised features from the base material rather than applying them as a separate layer. Second, Dr. Daniels makes the blanket and unsupported statement that each distinct layer “ha[s] its own thickness.” *Id.* Dr. Daniels fails to isolate the “raised features” from the “smoother” areas or perform any measurements of their individual thicknesses, much less the ratio claimed in the ‘287 patent. (Ex. 1047, 194:8-196:1; 204:15-23.) Simply making the abstract statement that features shown only in SEM images of the printed fabric face have their own “thicknesses” is insufficient to establish any correspondence with the claimed limitations.

96. At paragraph 118, Dr. Daniels purports to conduct elemental analysis of the first sample using Energy Dispersive X-Ray Spectroscopy (EDS). In my opinion, the reported findings are far from determinative and do not support Dr. Daniels’ conclusion that “the porous particles in the print layer are activated charcoal particles, as the oxygen indicates the activation process.” Ex. 2006 at ¶ 118. That is, while the EDS analysis shows evidence of carbon and oxygen, this is insufficient to prove that the print layer contains activated charcoal particles. Dr. Daniels’ has not eliminated the possibility of the confounding influence of other components of the print layer coating such as polymer binder, pigments, etc. These other components contain carbon and oxygen: hence, the presence of these two elements is not proof of a specific type of activated particle.

97. Further, the EDS report illustrates peaks for other elements in addition to carbon and oxygen. Dr. Daniels explains these results away by stating, “There may also be components that have been adsorbed onto the active surface of the carbon particles from the surroundings that the material encountered.” *Id.* As it is clear that the supposed activated charcoal particles were not separated from the other components of the print layer prior to conducting this analysis, it is at least as reasonable to conclude that these additional elements could be associated with the zeolites that Dr. Haggquist states to be also present in the composition. (Ex. 2011, 4-5.)

98. Finally, Dr. Daniels concludes that the high-magnification microscopy, SEM, and elemental analysis “overwhelmingly support that the TNF Laminate Our Print fabric consists of *at least two layers* of particles, the top layer of which contains dot like structures of *porous carbon particles* in a regular pattern.” Ex. 2006, at ¶ 120 (emphasis added). For at least the reasons I outlined above, I disagree that the evidence supports “two layers of particles” or that a top layer contains “porous” carbon particles. Based on the “location” of the pores on the surface of the particles – which I contend are not even visible from the SEM image provided – Dr. Daniels concluded that “the carbon particles of the print layer are *surface-active particles* of the type taught in the ‘287 Patent and are in contact with a *cured* base material.” *Id.* (emphasis added). As I iterated, Dr. Daniels failed to

conduct any testing to determine whether particles in the alleged “print layer” were “active” as required by the claims (e.g., by testing whether the particles improved MVTR of the first sample), nor did Dr. Daniels provide any support that the alleged base material was “cured.”

99. With respect to the second sample, Dr. Daniels performed nearly identical testing, which I similarly dispute. Ex. 2006 at ¶¶ 121-124. Again, there is no proof of any thicknesses, the claimed ratio, or any improved MVTR. (Ex. 1047, 194:8-196:1; 204:15-25). In my opinion, Dr. Daniels has provided little more than generalized, inconclusive testing to arrive at unsubstantiated and over-reaching conclusions.

C. Dr. Daniels failed to Show Adequate Nexus Between the Tested Samples and the Claim Limitations

100. As I noted above, I understand from Counsel that asserted objective evidence of non-obviousness must be tied to a specific product, and that the product must embody the invention disclosed and claimed in the patent. Dr. Daniels has not provided any evidence that either the first sample or the second sample includes the emphasized limitations below:

- a “*cured* base material comprising a *first thickness*,”
- a “plurality of *active* particles comprising a *second thickness*,”
- where “the first thickness comprises a thickness *at least 2.5 times larger* than the second thickness *but less than an order of magnitude* larger than the second thickness,”

- where “the active particles *improve the moisture vapor transport capacity* of the composition,” and
- where “a *moisture vapor transmission rate* of the water-proof composition comprises from *about 600 g/m²/day to about 11000 g/m²/day*”

101. In my opinion, Dr. Daniels could have conducted sample testing that would have provided support for the above limitations, but did not. For instance, while Dr. Daniels could have provided evidence of how the samples were prepared, he simply asserted that the base material was “cured.” Further, Dr. Daniels failed to show any evidence that the purported particles were “active,” as construed by the Board and explicitly required by claim 27. Dr. Daniels did not test the activity of the particles, nor did Dr. Daniels test the MVTR of the samples with and without the “print layer.” Accordingly, Dr. Daniels could not show that the particles improved the MVTR, or that the samples met the explicitly claimed MVTR range.

102. Furthermore, Dr. Daniels failed to show that the samples met key limitations that arguably led to allowance of the claims. By taking a simple cross-section of the samples, Dr. Daniels could have measured the thicknesses of the alleged “print layer” and the alleged “base material layer.” The measured thicknesses could then have been compared to determine whether the claimed ratio was met. It is unclear to me why Dr. Daniels would not make such measurements of the samples to evidence the claimed limitations. Nonetheless, in my opinion, Dr. Daniels has fallen far short of showing the requisite correspondence between the

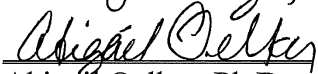
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samples (the specific product) and the claimed invention (as recited by claim 27). I also note that Patent Owner served an interrogatory response in the litigation, which states or implies that Patent Owner and its licensees do not practice the claims of the '287 patent. (Ex. 1045, Exhibit 4, 21-22) Therefore, it is my opinion that the Board should not consider the Patent Owner's evidence of secondary considerations.

VII. CONCLUSION

103. For the reasons presented above and in my first declaration, it remains my opinion that claims 27, 28, 30, 32, 33 and 35-39 of the '287 patent are unpatentable.

104. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: *January 11, 2019*

Abigail Oelker, Ph.D.