PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN COMPOSITE AEROGEL INSULATION MATERIALS AND METHODS FOR MANUFACTURING THE SAME**	**Investigation No. 337-TA-1003**

COMMISSION OPINION

The investigation is before the Commission for a final disposition on the issues under review, remedy, the public interest, and bonding. On review, the Commission has determined to affirm with modifications the administrative law judge's ("ALJ") final initial determination ("ID") finding that Aspen Aerogels, Inc. of Northborough, Massachusetts ("Aspen" or "Complainant") has proven a violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), by Nano Tech Co., Ltd. ("Nano") of Zhejiang, China, and Guangdong Alison Hi-Tech Co., Ltd. ("Alison") of Guangzhou, China (collectively, "Respondents") based on infringement of claims 15-17, and 19 of U.S. Patent No. 6,989,123 ("the '123 patent"); claims 11-13, 15, 17-19, and 21 of U.S. Patent No. 7,780,890 ("the '890 patent"); and claims 1, 7, and 9 of U.S. Patent No. 7,078,359 ("the '359 patent"). The Commission has also determined to affirm with modifications the ID's finding that Aspen has proven a violation of section 337 by Respondent Nano based on infringement of claims 12, 15, and 16 of the '359 patent. The Commission has further determined to reverse the ID's finding that Aspen has proven a violation of section 337 by both Respondents based on infringement of claim 5 of the '359 patent.

Because the Commission finds that the statutory public interest factors do not weigh against the issuance of a remedy in this investigation, the Commission has determined to issue a

limited exclusion order ("LEO") barring entry of both Respondents' composite aerogel insulation materials that infringe one or more of claims 1, 7, and 9 of the '359 patent; claims 15-17, and 19 of the '123 patent; and claims 11-13, 15, 17-19, and 21 of the '890 patent; and barring entry of Respondent Nano's composite aerogel insulation materials that infringe one or more of claims 12, 15, and 16 of the '359 patent. The Commission has also determined to set a bond of 100 percent of the entered value of the infringing products during the Presidential review period.

I. BACKGROUND

A. Procedural History

The Commission instituted this investigation on June 8, 2016, based on a complaint filed by Aspen. 81 *Fed. Reg.* 36955-956 (Jun. 8, 2016). The complaint alleges violations of section 337 in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain composite aerogel insulation materials and methods for manufacturing the same by reason of infringement of certain claims of the '359 patent, the '123 patent, and the '890 patent (collectively "the Asserted Patents"). The complaint also alleged violations of section 337 by reason of infringement of certain claims of U.S. Patent Nos. 7,399,439 (''the '439 patent'') and 9,181,486 (''the '486 patent''). *Id.* Nano and Alison are named as respondents in the Commission's notice of investigation. A Commission investigative attorney ("IA") participated in the investigation.

All asserted claims of the '439 patent and the '486 patent and certain asserted claims of the '359 have been terminated from the investigation. *See* Comm'n Notice, EDIS Doc ID 594197 (Nov. 2, 2016); Comm'n Notice, EDIS Doc ID 603311 (Feb. 9, 2017). The only remaining claims in this investigation are: claims 15-17, and 19 of the '123 patent; claims 1, 5,

7, 9, 12, 15, and 16 of the '359 patent; and claims 11-13, 15, 17-19, and 21 of the '890 patent ("the Asserted Claims").

On November 15, 2016, the ALJ issued Order No. 19, granting Aspen's motion for summary determination that the economic prong of the domestic industry requirement has been satisfied under section 337(a)(3)(A) and (B). The Commission determined to review-in-part Order No. 19 and, on review, affirmed with modification the summary determination that Aspen satisfies the economic prong of the domestic industry requirement. *See* Comm'n Notice at 1-2, EDIS Doc ID 597110 (Dec. 7, 2016).

On January 31, 2017, the ALJ issued Order No. 35, construing certain disputed claim terms of the Asserted Patents. Order No. 35, EDIS Doc ID 602687 (Jan. 31, 2017). The evidentiary hearing was held on February 17, 21-24, and 28, 2017.

On September 29, 2017, the ALJ issued her final ID and a recommended determination ("RD") on remedy and bonding in this investigation. The ID found a violation of section 337 by both Respondents in connection with claims 1, 5, 7, and 9 of the '359 patent; claims 15-17, and 19 of the '123 patent; and claims 11-13, 15, 17-19, and 21 of the '890 patent. The ID also found a violation of section 337 by Respondent Nano in connection with claims 12, 15, and 16 of the '359 patent. Thereafter, each party filed a petition for review of the final ID and responses to the petitions for review.[1,2] On October 31, 2017, the parties filed their public interest comments pursuant to Commission Rule 210.50(a)(4).

[1] Petition of Respondent Nano Tech Co., Ltd. for Review-In-Part of the Final Initial Determination (Oct. 16, 2017) ("NanoPet"); Respondent Guangdong Alison Hi-Tech Co., Ltd.'s Petition for Review of Initial Determination (Oct. 16, 2017) ("AlisonPet"); Office of Unfair Import Investigations' Contingent Petition for Review of Initial Determination (Oct. 16, 2017) ("IAPet"); Complainant Aspen Aerogels, Inc.'s Contingent Petition for Review of Initial Determination (Oct. 16, 2017) ("AspenPet"). Other than separate arguments made with regard to claims 5 and 9 of the '359 patent, Respondent Alison's petition for review is substantially the

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On November 30, 2017, the Commission determined to review the final ID in part and asked the parties to brief certain issues under review and to brief issues of remedy, the public interest, and bonding. Specifically, with respect to the '359 patent, the Commission determined to review the ID's construction of the "lofty fibrous batting" limitation in claim 1 of the '359 patent. The Commission's review of the "lofty fibrous batting" limitation did not include the ID's finding that Respondents have not proven that the limitation is invalid for indefiniteness. The Commission also determined to review the ID's constructions of the additional limitations in dependent claims 5 and 9, and the "total surface area of that cross section" limitation of claim 12, and the ID's associated findings on infringement and the technical prong of the domestic industry requirement with respect to those claims and dependent claims 15 and 16 of the '359 patent. In addition, the Commission determined to review the ID's findings that the asserted claims of the '359 patent are not invalid in view of Ramamurthi by itself or in combination with other prior art. With respect to the '123 and the '890 patents, the Commission determined to review the ID's findings that claim 15 of the '123 patent and claims 11-13, 15, 17, and 21-23 of the '890 patent are not obvious in view of Ramamurthi and either Uchida or Yada. The parties

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same as Nano's petition for review. This opinion cites only to Nano's petition for issues common to both Respondents.

[2] Complainant Aspen Aerogels, Inc.'s Combined Response to Respondents' and Staff's Petitions for Review of Initial Determination (Oct. 24, 2017) ("AspenResp"); Office of Unfair Import Investigations' Response to Petitions for Review of Initial Determination (Oct. 24, 2017) ("IAResp"); Nano Tech Co., Ltd.'s Combined Response to Aspen Aerogel, Inc.'s Contingent Petition for Review and the Office of Unfair Import Investigations' Petition for Review (Oct. 24, 2017) ("NanoResp"); Respondent Guangdong Alison Hi-Tech Co., Ltd.'s Combined Response to Aspen Aerogel, Inc.'s Contingent Petition for Review and the Office of Unfair Import Investigations' Petition for Review (Oct. 24, 2017) ("AlisonResp"). Alison's response to the petitions for review is substantially the same as Nano's response to the petitions for review. This opinion cites only to Nano's response.

filed their respective initial submissions on December 15, 2017,[3] and their respective reply submissions on December 22, 2017.[4]

B. U.S. Patent No. 7,078,359 ("The Product Patent")

The '359 patent, titled "Aerogel Composite with Fibrous Batting," issued on July 18, 2006. The '359 patent relates to "aerogel composites" used for thermal insulation that "exhibit[] improved performance . . . in one or more" areas, including "improved flexibility and drapeability; improved durability; [and] decreased aerogel particle shedding." JX-7 at 1:10-21. The background section of the patent discusses several prior art aerogel composite materials, including an aerogel matrix composite described in U.S. Patent No. 5,306,555 (Ramamurthi et al.). *Id.* at 1:62-2:21. The '359 patent states that Ramamurthi's aerogel matrix composite suffers from two major drawbacks: "having a high elastic modulus, making the products quite stiff as manufactured," and having "relatively high" thermal conductivities compared to the preferred embodiments of the present invention. *Id.* at 2:12-21. The '359 patent explains that "prior aerogel composite materials have not been suitable for many uses due to one or more of: low flexibility, low durability, excessive aerogel sintering when exposed to heat, less than ideal

[3] Complainant Aspen Aerogels, Inc.'s Written Submission on the Issues Identified in the Notice of Commission Decision to Review in Part a Final Initial Determination Finding a Violation of Section 337 (Dec. 15, 2017) ("AspenSub"); Brief of the Office of Unfair Import Investigations' on Issues Under Review and Remedy (Dec. 15, 2017) ("IASub"); Respondents' Written Submission Addressing Issues Raised in the Notice of Commission Determination to Review in Part a Final Initial Determination Finding a Violation of Section 337 (Dec. 15, 2017) ("RespSub").

[4] Complainant Aspen Aerogels, Inc.'s Combined Response to Respondents' and Staff's Written Submissions on the Issues Identified in the Notice of Commission Decision to Review in Part a Final Initial Determination Finding a Violation of Section 337 (Dec. 22, 2017) ("AspenReply"); Reply Brief of the Office of Unfair Import Investigations' on Issues Under Review and Remedy (Dec. 22, 2017) ("IAReply"); Respondents' Combined Reply to the Written Submissions of Complainant Aspen Aerogels, Inc. and the Office of Unfair Import Investigations (Dec. 22, 2017) ("RespReply").

thermal conductivity, [and] insufficient x-y thermal and/or electrical conductivity." *Id.* at 3:1-5. It is the aim of the '359 patent to solve these problems. *Id.* at 3:7-15.

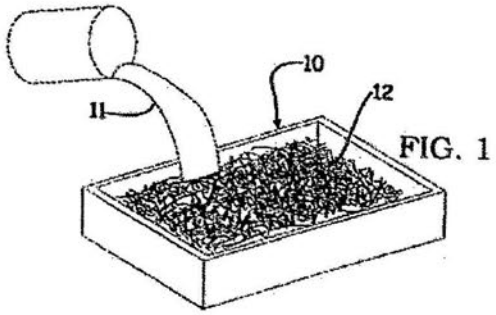

FIG. 1

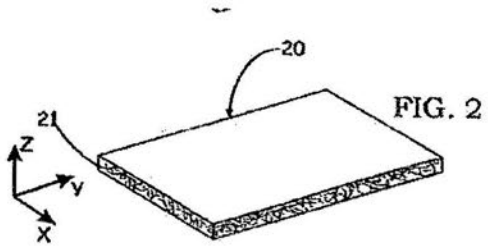

FIG. 2

Fig. 1 (reproduced above) of the '359 patent "illustrates the fabrication process of the present invention wherein a gel precursor **11** is added to a reinforcing batting **12** in some constraining mold type structure **10**." *Id.* at 4:65-5:1. The '359 patent describes an aerogel composite (*e.g.*, FIG. 2, element **20**) that has two parts: "reinforcing fibers and an aerogel matrix." *Id.* at 3:24-26, 5:1-4. The "reinforcing fibers are in the form of a lofty fibrous structure (i.e. batting)" (*e.g.*, FIG. 2, element **21**). *Id.* at 3:26-27, 5:1-3. "For the purposes of this patent, a lofty batting is defined as a fibrous material that shows the properties of bulk and some resilience (with or without full bulk recovery)." *Id.* at 7:1-3.

The '359 patent explains that a "batting is 'lofty' for purposes of this invention if it contains sufficiently few individual filaments (or fibers) that it does not significantly alter the thermal properties of the reinforced composite as compared to a non-reinforced aerogel body of the same material." *Id.* at 7:28-32. "Generally this will mean that upon looking at a cross-section of a final aerogel composite, the cross-sectional area of the fibers is less than 10% of the total surface area of that cross section." *Id.* at 7:32-35. The patent teaches that the "lofty batting preferably has a thermal conductivity of 50 mW/m-K, or less at room temperature and pressure to facilitate the formation of low thermal conductivity aerogel composites." *Id.* at 7:36-39.

The patent also explains that "[a]nother way of determining if a batting is sufficiently lofty to be within the scope of this invention is to evaluate its compressibility and resilience." *Id.* at 7:40-42. "In this case a lofty batting is one that (i) is compressible by at least 50% of its natural thickness, preferably at least 65%, and most preferably at least 80%, and (ii) is sufficiently resilient that after compression for a few seconds it will return to at least 70% of its original thickness, preferably at least 75%, and most preferably at least 80%." *Id.* at 7:42-48. The patent states that "[b]y this definition a lofty batting is one that can be compressed to remove the air (bulk) yet spring back to substantially its original size and shape." *Id.* at 7:48-50.

The '359 patent distinguishes a lofty batting from "a fibrous mat," which is "'a densely woven or thickly tangled mass,' i.e. dense and relatively stiff fibrous structures with minimal open space between adjacent fibers, if any.". *Id.* at 7:60-64.

The '359 patent teaches that dopants "may be added to improve thermal performance at higher temperatures." *Id.* at 6:9-13. According to the patent, "[s]uitable amounts of such dopants generally range from about 1 to 20% by weight of the finished composite, preferably about 2 to 10%." *Id.* at 6:15-17.

Aspen alleges both Respondents infringe claims 1, 5, 7, and 9 of the '359 patent, and only Respondent Nano infringes claims 12, 15, and 16 of the '359 patent. Claims 1 and 12 are independent. For example, claims 1, 7, 9, and 12 recite:

> **1.** A composite article to serve as a flexible, durable, light-weight insulation product, said article comprising a lofty fibrous batting sheet and a continuous aerogel through said batting.
>
> **7.** The composite article of claim 1, further comprising a dopant.
>
> **9.** The composite article of claim 7, wherein the dopant is present in an amount of about 1 to 20% by weight of the total weight of the composite.

> **12.** A composite article comprising a fibrous batting sheet and a continuous aerogel through said batting, where the batting is sufficiently lofty that the cross-sectional area of the fibers of the batting visible in the cross-section of the composite is less than 10% of the total surface area of that cross section.

Id. at 14:36-39, 15:14-19.

C. U.S. Patent Nos. 6,989,123 and 7,780,890 ("The Method Patents")

The '123 patent, titled "Methods to Produce Gel Sheets," issued on January 24, 2006. The '890 patent, titled "Advanced Gel Sheet Production," issued on August 24, 2010, and shares a common specification with the '123 patent. Both patents relate to "preparation of solvent filled gel sheets in a continuous fashion." JX-6 at 1:17-18. More specifically, the common specification describes methods for continuously combining a sol[5] "and an agent (heat catalyst or chemical catalyst) that induces gel formation and forming a gel sheet on a moving element such as a conveyor belt . . . by dispensing the catalyzed sol at a predetermined rate effective to allow gelation to [occur] on the moving element." *Id.* at 2:34-41. After gelation, the resulting gel sheets "are rolled into a plurality of layers." *Id.* at 3:41-44. The common specification describes the process as "a novel and effective way of producing gel sheets for efficient drying operations." *Id.* at 3:44-46.

By contrast, "[c]onventional methods for gel sheet and/or fiber-reinforced composite gel sheet production formed via sol-gel[6] chemistry . . . involve batch casting," which entails

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[5] "A sol is liquid with a colloidal suspension of solid particles." IAPet at 30 (citing Complainant Aspen Aerogels, Inc.'s Post-Hearing Brief at 7, EDIS Doc ID 605124 (Mar. 8, 2017) ("AspenPHB") (citing Tr. (Gould) at 94:1-3; Tr. (Schiraldi) at 406:5-10; Tr. (Scherer) at 947:9-17)). "A gel is formed by treating a sol with a catalyst that causes the suspended particles in the sol to connect together to form a three-dimensional lattice structure throughout the sol that holds all the liquid." *Id.* (citing AspenPHB at 8 (citing Tr. (Schiraldi) at 406:11-23; Tr. (Gould) at 93:16-94:12; Tr. (Scherer) at 845:17-19, 948:24-949:1)).

[6] "Sol-gel solution is another term for 'catalyzed sol.'" IAPet at 32 n. 8 (citing Tr. (Leventis) at 1040:21-1041:2).

"catalyzing one entire volume of sol to induce gelation simultaneously throughout that volume." *Id.* at 2:3-8. The common specification discusses Ramamurthi's batch casting method for preparing aerogel matrix composites as related prior art. *Id.* at 2:22-25. According to the common specification, the continuous casting methods "are greatly improved over conventional batch sol-gel casting methods for gel sheets" because, *inter alia*, "large volumes of material can be fashioned in a smaller production area than with traditional batch casting." *Id.* at 2:29-31, 3:63-64. In addition, with continuous casting methods, "gel properties can be controlled in a novel fashion to a degree not possible with batch casting methods." *Id.* at 3:21-23.

Referring to the exemplary embodiment shown in Fig. 8 (reproduced below) of the common specification, the continuous casting method comprises three phases. In the first phase, a stable sol precursor solution **21** and a catalyst **22** is mixed thoroughly by a static mixer **24** before being dispensed onto a conveyor belt **28** in a continuous manner. *Id.* at 10:59-61; 9:54-65. The catalyst **22** is added to induce gelation of the sol when added in a proper quantity in controlled conditions. *Id.* at 9:60-62. Fibrous batting materials **27** may be added to the sol prior to the point of polymer gelation to reinforce the matrix materials. *Id.* at 5:10-13; 9:65-67.

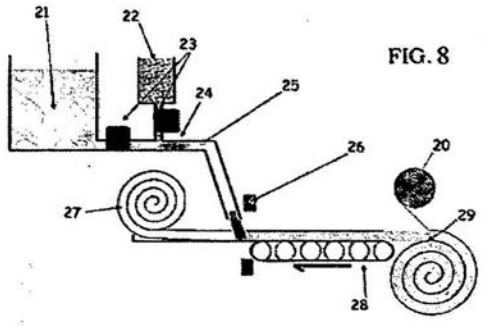


FIG. 8

"The second [phase] involves dispensing the blended sol onto a moving conveyor mold" and "may also include introduction of heat or radiation to the ungelled sol . . . to either induce gelation or modify the properties of the gel." *Id.* at 6:45-51. Control of the variables in gel

formation, such as solution pH, "can permit control of the growth and aggregation of the matrix species [organic, inorganic, or inorganic/organic hybrid] throughout the transition from the 'sol' state to the 'gel' state." *Id.* at 5:4-6, 8:19-24.

In the third phase, gels are cut and conveyed to a postprocessing area, or the gel sheets are rolled **29** into a plurality of layers. *Id.* at 3:41-44, 6:52-57, 9:39-41 ("Gel composite sheets can be produced in rolled form if mechanically wound at the end of the belt."), 10:2-3, 10:62-63 (gel sheets are rolled onto a mandrel), Figs. 1, 8. When rolled, the gel sheets can be rolled with a permeable or impermeable spacer material to provide "a favorable flow pattern in a subsequent drying," as well as "flow paths for subsequent silation (aging) fluids to easily pass through." *Id.* at 3:46-54, 10:63-11:5.

Aspen alleges both Respondents infringe claims 15-17 and 19 of the '123 patent. Independent claim 15 is illustrative of these asserted claims and recites:

> **15.** A process for preparing gel sheets, comprising the steps of:
> dispensing a catalyzed sol onto a moving element as a continuous sheet;
> rolling the dispensed sheet into a plurality of layers.

Id. at 14:48-52.

Aspen also alleges both Respondents infringe claims 11-13, 15, 17-19, and 21 of the '890 patent. Independent claim 11 is illustrative of these asserted claims and recites:

> **11.** A method for preparing gel sheets, comprising the steps of:
> dispensing a sol onto a moving element as a continuous sheet;
> rolling the dispensed sheet into a plurality of layers; and
> drying the layers.

JX-9 at 13:64-14:2.

D. Key Prior Art

i. U.S. Patent No. 5,306,555 ("Ramamurthi")

Ramamurthi discloses aerogel matrix composites (AMCs) composed of fibers mixed with an aerogel. RX-11 at 1:10-15, 2:3-8, 16:42-47. Ramamurthi explains that, in contrast to monolithic aerogels known in the art that are "extremely fragile and have low elasticities," the disclosed fiber reinforced AMCs can have a range of flexibilities and possess "enhanced strength, decreased sensitivity to moisture, [and] good thermal insulation values." *Id.* at 2:3-8, 3:57-59, Fig. 1 (comparing the properties of fiber reinforced AMCs with conventional aerogels). The fibers are added "[t]o enhance the mechanical properties of these sol-gel derived monolithic aerogels." *Id.* at 4:10-14. Ramamurthi discloses fibers that are in the "form of individual fibers, bundles of fibers, mats or sheets, woven or unwoven." *Id.* at 4:35-37. Ramamurthi also discloses the use of "glass wool" and "rock wool" as materials from which the fibers can be made. *Id.* at 4:27-29, 6:49-9:58.

Ramamurthi also discloses a batch method for preparing AMCs. *See id.* at 1:10-15, 2:3-8. The method generally comprises: "preparing an aerogel precursor; mixing fibers with the aerogel precursor; aging the aerogel precursor containing the fibers to obtain a gelled composition; completely submerging the gelled composition in a liquid suitable for supercritical drying;" and then drying the gelled composition. *Id.* at 2:15-31.

In one disclosed embodiment, Ramamurthi describes a method for preparing "[r]igid varieties of AMCs . . . by supercritically drying a silicate sol-gel solution reinforced with varying loadings of pyrex glass wool." *Id.* at 7:18-20. Ramamurthi teaches mixing a sol with a catalyst to produce a "sol-gel solution that is flowable for a brief period following mixing." *Id.* at 7:26-34. Ramamurthi also teaches "[s]ilica fibers, cut to 4-6 inches . .. in length, were laid in a thin layer in a silicone rubberized mold" before "a small amount of sol-gel solution was poured and a

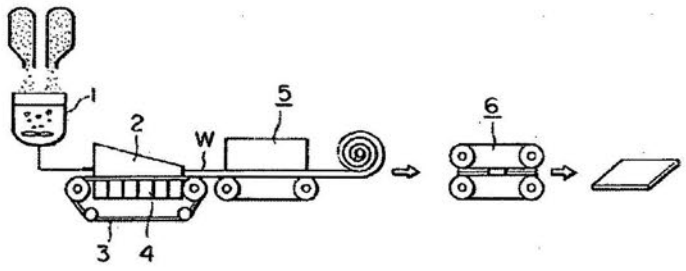
layer of silica fibers was overlaid at an angle of 90 [degrees] to the earlier layer." *Id.* at 7:34-39. Ramamurthi describes that the "alternate layers of fibers and sol-gel solution resulted in a fiber-gel composition with a weaved silica fiber mat." *Id.* at 7:39-41. "The AMC samples had good thermal insulation properties, with thermal conductivities ranging from 0.014 and 0.021 W/mK." *Id.* at 9:48-50.

In connection with another disclosed embodiment, Ramamurthi describes the "effect of compressive load on the thermal insulation values of AMCs." *Id.* at 11:6-7. Specifically, a sample "was compressed at 27-28 psi . . . such that the disc thickness decreased from . . . 1.57 cm to 1.27 cm." *Id.* at 11:9-12. "After the loads were removed the sample sprang back to almost the same original thickness of approximately . . . 1.55 cm." *Id.* at 11:12-14.

ii. U.S. Patent No. 6,123,882 ("Uchida")

Uchida discloses an apparatus for manufacturing "fiber reinforced thermoplastic resin sheet[s]." RX-14 at 1:7-9. In one embodiment of the Uchida apparatus (Fig. 1, reproduced below), thermoplastic resin and reinforcing fibers are mixed in dispersion tank **1**. *Id.* at 2:15-26.

FIG. 1



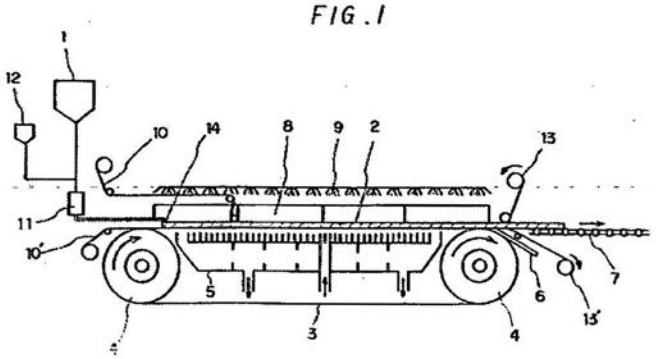
The resulting aqueous dispersion is then transferred onto mesh belt **3** having "small pores penetrating to its reverse surface." *Id.* at 2:32-37. The aqueous medium is then "sucked" through the small pores of the belt into suction box **4**, thereby separating the thermoplastic resin and reinforcing fibers from the aqueous medium. *Id.* at 2:33-41. The web material remaining on

mesh belt **3** is transferred to drying section **5**, where residual water is removed, "the thermoplastic resin is melted by heating to a temperature above the melting point of the resin," and the resulting web "is wound into a roll by a take-up reel." *Id.* at 2:43-44, 2:56-65. The web is then transferred to consolidating section **6**, where "the web is cut and heat-pressed so that the thermoplastic resin is thoroughly impregnated into the reinforcing fibers." *Id.* at 2:66-3:2.

iii. U.S. Patent No. 5,004,761 ("Yada")

Yada "relates to a process for the continuous preparation of an acrylic polymer, and more particularly to an improved process for continuously preparing an acrylic polymer by photopolymerization of a monomer on a moving support." RX-17 at 1:6-10. These acrylic polymers are used, for example, as durable drinking cups or desktop organizers. AspenResp at 61 (citing Tr. (Schiraldi) at 1177:6-8). Yada describes "continuously feeding an aqueous monomer solution in the form of a thin layer onto a moving support" and "continuously taking the produced sheet-like polymer gel off the support." RX-17 at 1:11-20, 5:35-37. The "moving support" can be a "belt used in an industrial production" and is preferably "an endless belt." *Id.* at 2:49-50, 6:63-64. Yada describes producing polymer gel using this process, with polymerization of the monomer solution beginning "200 mm from the inlet end" and transformation of the monomer solution to "a nonflowable pudding-like gel . . . 400 mm from the inlet end." *Id.* at 10:8-14, Fig. 1 (reproduced below).

FIG. 1



E. Products at Issue

Aspen accuses Respondent Alison's Composite Blankets DRT603, DRT606, DRT610, and GR1006 of infringing one or more of the Asserted Claims. Specifically, Aspen alleges that all variants of these Alison products infringe claims 1 and 5 of the '359 patent, but only [redacted] infringe claims 7 and 9 of the '359 patent. ID at 26 (Table 2). Aspen also alleges that only [redacted] infringe the asserted claims of the Method Patents. *Id.* at 27 (Table 2). Aspen stipulates that products [redacted] do not infringe any asserted claims of the Method Patents, but Aspen alleges that those products infringe certain claims of the '359 patent. *Id.*; JX-28C (Stipulation). Products [redacted] have a "Z" designator in the product name, *e.g.*, DRT610-Z. *Id.*

Aspen accuses Respondent Nano's Composite Blankets FMA450, FMA650, FMB350, FMB350-6, FMC100, FMC200, and FMD400 [redacted] of infringing the asserted claims of the Method Patents (except claim 12 of the '890 patent) and claims 1, 5, 7, and 9 of the '359 patent. ID at 28 (Table 3). Aspen also alleges that only variants of these Nano products that are [redacted] infringe claim 12 of the '890 patent. *Id.* Furthermore, Aspen alleges that only Nano's Composite Blankets FMB350-6 and FMC200 [redacted] infringe claims 12, 15, and 16 of the '359 patent. *Id.* at 28-29 (Table 3).

Aspen asserts that its Cryogel, Cryogel Z, Spaceloft, Spaceloft Subsea, and Pyrogel products, and the methods Aspen uses to make them practice certain claims of the Asserted Patents. *Id.* at 29-30 (Table 4).

II. ANALYSIS

A. THE PRODUCT PATENT

With respect to the '359 patent, the Commission affirms the ID's finding of a violation of section 337 by both Respondents in connection with claims 1, 7, and 9, and by Respondent Nano in connection with claims 12, 15, and 16, but reverses the ID's finding of a violation of section 337 by both Respondents in connection with claim 5. As explained below, the Commission affirms with modified reasoning the ID's constructions of the "lofty fibrous batting" limitation in claim 1 and the "about 1 to 20%" limitation in claim 9. The Commission modifies the ID's constructions of the additional limitation in claim 5 and the "the total surface area of that cross section" limitation in claim 12. Applying the Commission's claim constructions, the Commission affirms the ID's finding that both Respondents infringe claims 1, 7 and 9, and that Respondent Nano infringes claims 12, 15, and 16, but reverses the ID's finding that both Respondents infringe claim 5. The Commission also reverses the ID's finding that Aspen's domestic industry products practice claim 5, but affirms the ID's finding that Aspen's domestic industry products practice the other asserted claims. The Commission further affirms with modifications the ID's finding that claims 1, 5, 7, 9, and 12 are not anticipated by Ramamurthi and that claims 9 and 16 are not rendered obvious in view of Ramamurthi and other prior art. Finally, the Commission takes no position on the ID's findings on secondary considerations of nonobviousness.

i. Claim 1 of the '359 Patent

a. *Claim Construction*

Independent claim 1 of the '359 patent recites "a lofty fibrous batting." Claims 5, 7, and 9 of the '359 patent depend from claim 1. The ID construed "lofty . . . batting" to mean "a fibrous material that shows the properties of bulk and some resilience (with or without full bulk

recovery)." Order No. 35, Appendix A at 4-5 (citing JX-7 at 7:1-3). We find that the intrinsic evidence supports the ID's claim construction.

There is no dispute that the patentees acted as their own lexicographers in the '359 patent: "For the purposes of this patent, ***a lofty batting is defined as*** a fibrous material that shows the properties of bulk and some resilience (with or without full bulk recovery)." JX-7 at 7:1-3 (emphasis added). Immediately following this definition, the patent specification describes types of "batting" and characteristics of "reinforcing fibrous material" that constitute a sufficiently "lofty" batting for purposes of the invention:

> The reinforcing fibrous material used in the present invention is one or more layers of a lofty fibrous batting . . .While generally a "batting" is a product resulting from carding or Garnetting fiber to form a soft web of fiber in sheet form, for purposes of this invention "batting" also includes webs in non-sheet form, e.g. the Primaloft® products from Albany International, provided that they are sufficiently open to be "lofty."
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> . . . .
>
> ***A batting is "lofty" for purposes of this invention*** if it contains sufficiently few individual filaments (or fibers) that it does not significantly alter the thermal properties of the reinforced composite as compared to a non-reinforced aerogel body of the same material. Generally this will mean that upon looking at a cross-section of a final aerogel composite, the cross-sectional area of the fibers is less than 10% of the total surface area of that cross section, preferably less than 8%, and most preferably less than 5%.
>
> . . . .
>
> ***Another way of determining if a batting is sufficiently lofty to be within the scope of this invention*** is to evaluate its compressibility and resilience. In this case a lofty batting is one that (i) is compressible by at least 50% of its natural thickness, preferably at least 65%, and most preferably at least 80%, and (ii) is sufficiently resilient that after compression for a few seconds it will return to at least 70% of its original thickness, preferably at least 75%, and most preferably at least 80%. ***By this definition*** a lofty batting is one that can be compressed to remove the air (bulk) yet spring back to substantially its original size and shape.

Id. at 7:11-50 (emphasis added). The patent specification also describes what does not constitute a "lofty [] batting" for purposes of the invention:

> The batting useful herein is substantially different from a fibrous mat. A fibrous mat is "a densely woven or thickly tangled mass," i.e. dense and relatively stiff fibrous structures with minimal open space between adjacent fibers, if any. While a mat generally has a density of greater than 25 lbs/ft^3 (0.41 g/cc), a lofty batting useful herein has a much lower density, i.e. in the range of about 0.1 to 16 lbs/ft^3 (0.001-0.26 g/cc), preferably about 2.4 to 6.1 lbs/ft^3 (0.04 to 0.1 g/cc). Generally, mats are compressible by less than about 20% and show little to no resilience. In an aerogel composite prepared with a mat reinforcement, the cross sectional surface area of the mat fibers is about 30 to 50% of the total surface area of the cross section.

Id. at 7:60-8:5.

The '359 patent's prosecution history provides insight as to the applicants' and the PTO examiner's understanding of the meaning of the "lofty [] batting" term. During prosecution of the '359 patent, the PTO examiner expressly stated in her Reasons for Allowance that the specification defines "lofty fibrous batting" as "a fibrous material that shows the properties of bulk and some resilience (with or without full bulk recovery)" and "clearly distinguishes the difference between a fibrous mat and batting." JX-1 at 353. In response to the Reasons for Allowance, the applicants stated:

> A lofty fibrous batting is a fibrous material defined by the terms "lofty" and "batting" such that the batting is not limited solely by properties of bulk and some resilience. Instead, the specification includes detailed discussion and guidance regarding a lofty fibrous batting to a person of skill in the art. That discussion and guidance includes at least the portion extending from page 11, first full paragraph, through page 13, first full paragraph.

Id. at 361-362.[7] Thus, in view of the intrinsic evidence as a whole, we find that the applicants did not intend to limit the scope of "lofty [] batting" beyond the express definition provided in the specification.

The Commission rejects Aspen's argument that the ID's construction is too broad and that it should be further limited to batting that it is "compressible by at least 50% of its natural

[7] The applicants' reference to pages 11 through 13 corresponds to the portion of the '359 patent specification from columns 7 and 8 reproduced above (*supra* at 16-17).

thickness, and has resilience such that it will return to at least 70% of its thickness." AspenPet at 7. Aspen's proposed construction arbitrarily imports one characteristic, *i.e.*, the 50% compressibility and 70% resilience, and ignores the patent's other described characteristics of a "lofty batting" such as, thermal properties, cross-sectional area of fibers, and density ranges. *See* JX-7 at 7:33-36 ("upon looking at a cross-section of a final aerogel composite, the cross-sectional area of the fibers is less than 10% of the total surface area of that cross section, preferably less than 8%, and most preferably less than 5%"), 7:36-38 ("The lofty batting preferably has a thermal conductivity of 50 mW/m-K, or less at room temperature and pressure . . . ."), 7:65-8:1 ("a lofty batting useful herein has a much lower density, i.e. in the range of about 0.1 to 16 lbs/ft^3 (0.001–0.26 g/cc), preferably about 2.4 to 6.1 lbs/ft^3 (0.04 to 0.1 g/cc).").

b. *Validity*

The ID found that Respondents have not shown by clear and convincing evidence that Ramamurthi anticipates independent claims 1 and 12. Specifically, the ID found that Ramamurthi does not disclose a fibrous batting sheet that is "lofty" (claim 1) or "sufficiently lofty" (claim 12) and "a continuous aerogel through said batting" (claims 1 and 12). ID at 106-118. The Commission affirms the ID's finding with certain modifications as explained below.

In their petition for review, Respondents argue that "a person of ordinary skill in the art would know that at least some of the fibrous batting used in Ramamurthi was a 'lofty' type," because the Ramamurthi aerogel composite "achieve the desired mechanical and thermal properties that would only occur with a 'lofty' batting." NanoPet at 11 (citing RX-11 at Fig. 1; Tr. (Gould) at 113:21-25, 116:2-6; Tr. (Leventis) at 298:14-18). The IA made the same argument. IAPet at 19. Respondents also argue since "the ALJ acknowledged that the

Ramamurthi composite aerogel is flexible (as well as durable and lightweight), it must use a lofty batting to achieve those characteristics." NanoPet at 20.

Under the ID's construction of "lofty" batting, Respondents assert that Ramamurthi discloses a batting that has "bulk." *Id.* at 18 (citing RX-11 at 12:46-51). Respondents argue that the ID erred in finding Ramamurthi's "porous spaces in the silica fiber matrix" does not disclose "bulk" because the ID improperly redefined "bulk" to be limited to "***only*** a specific type of air, namely the air or empty space 'that is generated by the specific intertwining of the fibers in such a way that gives the batting the property of resilience.'" *Id.* at 13-14 (citing ID at 113), 18.

Respondents and the IA assert that Ramamurthi inherently discloses a batting that has "some resilience" because Ramamurthi's disclosure of "glass wool" is generally the same thing as fiberglass and the '359 patent teaches that fiberglass is compressible and "springs back." *Id.* at 18 (citing JX-7 at 7:56-59); IAPet at 17. Respondents argue that the ID erred in relying on the ASTM Handbook cited by Aspen's expert listing different applications of fiberglass fibers. NanoPet at 18; ID at 107 (citing CX-1870.0008). According to Respondents, just because the book discloses "that ***fibers*** can be arranged in a variety of configurations" does not mean that Ramamurthi's "***mats and sheets***, such as ***glass wool*** and ***rock wool*** . . . would *not* have bulk and resilience." NanoPet at 19.

Respondents further assert that Example 1-B of "Ramamurthi expressly discloses a sample composite aerogel that was compressible and resilient." *Id.*; RX-11 at 11:6-14; Tr. (Gnade) at 667:1-13. Respondents argue that the ID erred in concluding that aerogel alone, and not the batting, could account for the resilience in the batting used in Ramamurthi. NanoPet at 19 (citing ID at 111). In particular, Respondents contend that the ID erred in relying on a publication that was published almost twenty years after the Ramamurthi invention to show that

pure silica aerogel can be 92% resilient at 20% compression. *Id.* at 19-20 (citing ID at 112 (citing CX-1877, "Super-Compressibility of Ultralow-Density Nanoporous Silica," S. O. Kucheyev, et. al., Advanced Materials, 24, 776-780 (Jan. 9, 2012))).

Respondents further argue that the "mat" used in Example 2 of Ramamurthi is different from the dense mat described years later in the '359 patent because Dr. Leventis and Dr. Gnade agreed Ramamurthi's mat described in Example 2 must be lofty to have such excellent thermal characteristics. *Id.* at 21 (citations omitted). Still further, Respondents' expert testified that the "mat" in Example 2 of Ramamurthi has a low density within the range disclosed in the '359 patent. *Id.* at 22 (citing Tr. (Gnade) at 671:7-12). Respondents contend that the ALJ abused her discretion in striking Dr. Gnade's testimony even though she denied Aspen's motion to strike that very testimony in Order No. 38. *Id.* at 22 n. 7.

As an initial matter, the Commission notes that "although the burden of proof for showing invalidity remains clear and convincing evidence, that burden may be harder to meet 'when the invalidity contention is based upon the same argument on the same reference that the PTO already considered.'" *Sciele Pharma Inc. v. Lupin Ltd.*, 684 F.3d 1253, 1260 (Fed. Cir. 2012). Here, Ramamurthi was not only before the PTO examiner, but it was discussed during prosecution, distinguished in the '359 patent specification, and considered by the PTAB in *inter partes* review proceedings.[8] AspenResp at 23 ((citing JX-1 at 348-354; JX-7 at 1:62-2:21; CX-2272 at 2-9 (denying institution of IPR re '359 patent)). The examiner allowed the claims over Ramamurthi and the PTAB denied *inter partes* review of the '359 patent. *Id.*

[8] Respondent Alison filed a Petition seeking *inter partes* review of claims 1-3, 5-7, 9, and 49 of the '359 patent. CX-2272 at 2. Among other grounds, Respondent Alison contended before the PTAB that Ramamurthi anticipates claims 1-3, 5-7, and 49 and that Ramamurthi by itself and/or in combination with other prior art renders claim 9 obvious. *Id.* at 3. The PTAB denied institution of an *inter partes* review of these claims of the '359 patent. *Id.* at 18.

Respondents' invalidity theory with respect to Ramamurthi's alleged disclosure of the claimed "lofty" batting relies on the doctrine of inherent disclosure. *See* ID at 106 (citing Tr. (Gnade) at 670:14-19). Respondents do not argue that Ramamurthi itself discloses that its glass wool and rock wool have these properties. Instead, they argue that these are intrinsic properties of Ramamurthi's glass wool and glass wool in general. "Inherency requires that essentially all species must have the property in question for it to be 'inherent' in the genus." AspenResp at 27 (citing *In re Brink*, 419 F.2d 914, 917-18 (C.C.P.A. 1970)).

However, based on the record evidence, we find that Aspen has shown that Ramamurthi not only does "not disclose fiber arrangements that necessarily have the bulk and resilience needed to be a lofty batting sheet," but actually describes fiber arrangements that *lack* those properties. *Id.* at 23-24, 28. Relying on the testimony of Aspen's expert, the ID identified several examples of glass wool products that are not lofty battings: "(1) loose collection of individual fibers; (2) rovings (rope-like cylindrical structures) which plainly are not [lofty batting] sheets; and (3) dense fibrous mats (which the '359 patent expressly distinguishes from a lofty batting)." ID at 108 (citing Tr. (Leventis) at 1027:11-25).

Furthermore, the record evidence supports the ID's conclusion that Respondents' expert "did not present credible evidence supporting his conclusions" that Ramamurthi's glass wool and rock wool exhibit the properties of bulk and resilience. ID at 106. As the ID found, Respondents' expert "pulled one particular picture of one particular glass wool from a Wikipedia article and asserted without testing or analysis that it is lofty." *Id.*; *see* Tr. (Gnade) at 669:16-670:19. The conclusory testimony of Respondents' expert and Respondents' attorney arguments cannot supplant the requirement of anticipatory disclosure in Ramamurthi itself. Even Respondents appear to have conceded that "the categories 'glass wool' and 'fiberglass' may

include both lofty and non-lofty battings." *See* NanoPet at 11. Respondents argue that "a person of ordinary skill in the art would appreciate that Ramamurthi's disclosure of glass wool battings would include 'lofty' batting," and not non-lofty batting. *Id.* But other than attorney argument, Respondents present no evidence to support their argument. *Id.*

Still further, Respondents' petition improperly shifts the burden of persuasion to Aspen. *See, e.g., id.* at 18 ("Aspen did not provide any credible evidence that a glass wool (as opposed to glass fibers generally) would not be resilient, especially materials with the characteristics described in Ramamurthi which [are] the same as in the '359 patent."); 19 ("The ALJ – and Aspen – failed to identify any configurations of fibrous mats and sheets, including glass wool and rock wool, that would *not* have bulk and resilience.").

Even if some types of glass wool or rock wool exhibit properties of bulk and resilience, this is not sufficient to demonstrate the inherency of bulk and resiliency in the glass wool and rock wool disclosed in Ramamurthi. *See Brink*, 419 F.2d at 917-18. Ramamurthi describes its glass wool as constituting randomly-oriented individual fibers laid down "in a thin layer," a flat fiber mat, and a layer of pure aerogel sandwiched between two flat fiber mats. AspenResp at 29 (citations omitted). The Commission finds that Aspen's expert has convincingly explained why these fiber arrangements do not exhibit the properties of bulk and resilience. Aspen's expert demonstrated that the resilience of a final aerogel composite product may not necessarily be a result of the fibrous batting, but can come from interactions between the aerogel and the fibers and, to some extent, even the aerogel itself. *See* Tr. (Leventis) at 1045:24-1047:9, 1048:8-1049:9, 1145:8-21. For example, while Ramamurthi discloses an exemplary aerogel composite product that exhibits a small amount of compressibility and resilience, the ID correctly points out that Ramamurthi does not expressly teach the compressibility or resilience of the fibrous element

itself that is used in the composite product. RX-11 at 11:11-14; ID at 111-113; Tr. (Leventis) at 1045:24-1047:9; AspenResp at 24. Even if it may be possible to rearrange Ramamurthi's glass wool fibers into a configuration or arrangement that exhibits bulk and some resiliency, that is not sufficient to demonstrate the inherency of such properties in the material disclosed by Ramamurthi. "The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient." *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010) (citations omitted).

Respondents argue that the ID's reliance on expert testimony based on information published in 2000 in the ASTM Handbook of Composites and literature published in 2012 concerning the properties of pure silica aerogel was an abuse of discretion. Since Respondents have not presented *prima facie* evidence that Ramamurthi discloses "lofty" batting, we find that the ID's reliance on such evidence is harmless error. Moreover, since Respondents do not suggest that the species of glass wool and the properties of pure silica aerogel discussed in the ID changed since 1992, the year the Ramamurthi patent application was filed, the disputed evidence certainly raises doubt as to Respondents' inherency theory.[9]

Finally, Respondents' argument that Ramamurthi's fibrous materials must be "lofty" because they exhibit good thermal conductivity, have low density, and high porosity is unpersuasive. *See* NanoPet at 11, 21-22. Respondents do not identify or explain the point at which a fibrous material transitions from "not lofty" to "lofty" in terms of porosity, density, or

[9] Aspen's expert testified as to his own personal experience of 35 years using glass wool that does not show the properties of bulk and resilience. Tr. (Leventis) at 1028:1-17. However, Respondents argue any reliance on that testimony is an abuse of discretion because Aspen's expert did not cite such material in his expert report or deposition, and Aspen did not refer to it in its prehearing brief. NanoPet at 19 n.5. The Commission's determination that Respondents have not presented sufficient evidence to support their inherency argument does not rely on this testimony.

thermal conductivity to support their inherency argument. Without such information, Respondents' argument is insufficient to assess whether Ramamurthi's fibrous materials are "lofty." Moreover, Dr. Leventis and Dr. Gnade appear to agree that it is possible for a fiber material to have low density and not be lofty. AspenResp at 37 (citing Tr. (Gnade) at 748:11-16; Tr. (Leventis) at 1031:3-1032:16).

Aside from the Commission's analysis above, the Commission makes two modifications to the ID's analysis as to whether claim 1 of the '359 patent is anticipated by Ramamurthi. First, as part of the ID's discussion of the evidence showing that Ramamurthi discloses the preamble of claim 1 ("A composite article to serve as a flexible, durable, light-weight insulation product"), the ID states that the "evidence adduced in this Investigation demonstrates that Ramamurthi discloses a composite aerogel that is the same as that disclosed in the '359 patent." ID at 104. Respondents argue that this statement from the ID supports their argument that Ramamurthi's composite aerogel exhibits the same properties of bulk and resilience as the claimed composite aerogel. However, this statement merely establishes that Ramamurthi's composite aerogel satisfies the preamble of claim 1. Nevertheless, the Commission strikes this statement in the ID (at 104) since it is confusing and unnecessary.

Second, the ID stated that "Dr. Gnade's testimony regarding his density calculation of the batting used in Ramamurthi's Example 2 is stricken." *Id.* at 109; *see also id.* at 118. Respondents argue that the ALJ erred in striking this testimony because she denied Aspen's motion to strike this very same testimony in Order No. 38. NanoPet at 22 n.7; Order No. 38 at 5-7, EDIS Doc ID 609482 (Apr. 24, 2017). The Commission finds the ALJ's determination to strike this portion of Dr. Gnade's testimony to be harmless error because both parties' experts agreed that low density fiber does not inherently create a lofty batting. ID at 109-111.

In view of the above, we affirm with modifications the ID's finding that Respondents have not shown by clear and convincing evidence that Ramamurthi discloses a fibrous batting sheet that is "lofty" as recited in independent claim 1 of the '359 patent and that is part of asserted claims 5, 7, and 9 of the '359 patent. For the same reasons, Respondents have not shown by clear and convincing evidence that Ramamurthi discloses a "sufficiently lofty" fibrous batting sheet as recited in independent claim 12 of the '359 patent and that is part of asserted claims 15 and 16 of the '359 patent.

ii. Claim 5 of the '359 Patent

a. *Claim Construction*

Claim 5 of the '359 patent recites "the lofty fibrous batting consists essentially of fibers having a thermal conductivity less than 50 mW/m-K." Other than "lofty . . . batting," the parties did not ask the ALJ to construe any other limitation in this claim. The ID adopted Aspen's interpretation of claim 5 to require that the "batting" as a whole, instead of the individual "fibers" in the batting, have the specified thermal conductivity. *Id.* at 92. The ID based its construction on (i) the specification's statement that "[t]he lofty batting preferably has a thermal conductivity of 50 mW/m-K, or less at room temperature," (ii) the testimony of Aspen's expert that one of ordinary skill in the art would not read claim 5 as requiring fibers to meet the thermal conductivity requirement; and (iii) [redacted]. *Id.* at 90-91.

Respondents and the IA argue that the ID's interpretation of claim 5 of the '359 patent is legal error because it is based on extrinsic evidence that is inconsistent with the undisputed plain language of the claim. IAPet at 11-12; NanoPet at 38-39; AlisonPet at 94-95. Alison argues that the ID's interpretation reads out the words "consists essentially of" from the claim. AlisonPet at 95. The IA notes that Aspen's expert admitted that his proposed construction was contrary to the

plain unambiguous meaning of the claim. IAPet at 13 (citing Tr. (Leventis) at 314:2-315:6). The IA also notes that "the statement the ID cites in the specification and claim 5 are drafted using different language," and other claims in the '359 patent and portions of the specification focus on the properties of the fibers that comprise the lofty batting. IAPet at 13-14; *see* AlisonPet at 95-96. Under their interpretation of claim 5, Respondents and the IA assert that the evidence undisputedly does not support the ID's findings that the accused products infringe claim 5 and that the domestic industry products practice claim 5. IAPet at 14-15; NanoPet at 39-40; AlisonPet at 96.

Aspen argues that the ID's conclusion "is mandated by the patent specification, expert testimony, and the testimony of Respondent Alison's own chief engineer." AspenResp at 96. Aspen notes that the patent specification explains that "[t]he lofty batting preferably has a thermal conductivity of 50 mW/m-K." *Id.* (quoting JX-7 at 7:36-39). Aspen asserts that its expert stated that this portion of the specification "resolves any doubts that might exist" about the interpretation of claim 5. *Id.* (citing Tr. (Leventis) at 314:9-315:6). According to Aspen, that expert also explained that a person of ordinary skill would not read claim 5 as referring to the thermal conductivity of individual batting fibers because "what we are interested in is the thermal conductivity of the batting itself so we can infer the effects it might have to the final product, not the individual fibers." *Id.* (citing Tr. (Leventis) at 314:2-315:6).

Having reviewed the record evidence, the Commission finds that application of Federal Circuit precedent in this case necessitates a modification of the ID's construction. The Federal Circuit has repeatedly stated that the unambiguous plain meaning of a claim limitation controls and extrinsic evidence cannot be used to contradict the plain meaning. *See, e.g., Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group. Inc.*, 262 F.3d 1258, 1267-69 (Fed. Cir. 2001)

("[I]f the meaning of the claim limitation is apparent from the intrinsic evidence alone, it is improper to rely on extrinsic evidence other than that used to ascertain the ordinary meaning of the claim limitation."); *Northern Telecom Ltd. v. Samsung Elecs., Co.*, 215 F.3d 1282, 1295 (Fed. Cir. 2000) ("[E]xtrinsic evidence is rarely, if ever, probative of a special and particular definition of a limitation found in a claim ... because extrinsic evidence 'may not be used to vary or contradict the claim language' as discerned from the intrinsic record.").

In this case, the claim language unambiguously requires that the individual fibers in the fibrous batting meet the specified thermal conductivity. The ID erroneously relied on the testimony of Aspen's expert and the testimony of a fact witness to contradict the unambiguous plain meaning. Moreover, the ID's interpretation of claim 5 renders superfluous the "consists essentially of fibers" language.

While Aspen correctly notes that the patent specification explains that "[t]he lofty batting preferably has a thermal conductivity of 50 mW/m-K," we are not convinced that this portion of the specification "resolves any doubts that might exist" about the interpretation of claim 5. AspenResp at 96 (quoting JX-7 at 7:36-39; Tr. (Leventis) at 314:9-315:6). As the IA notes, "the statement the ID cites in the specification and claim 5 are drafted using different language." IAPet at 13-14. Accordingly, the Commission construes claim 5 to require that the individual "fibers," as opposed to the "batting" as a whole, have the claimed thermal conductivity, *i.e.*, less than 50 mW/m-K.

b. *Infringement and Technical Prong*

It is undisputed that Aspen did not offer any evidence that the batting used in the accused products and the domestic industry products "consists essentially of fibers having a thermal conductivity less than 50 mW/m-K" as required by claim 5. *See* IAPet at 14-15; NanoPet at 39-

40; AlisonPet at 96. Thus, Aspen has failed to establish infringement and domestic industry with respect to claim 5 of the '359 patent. Accordingly, the Commission reverses and vacates those portions of the ID. *See* ID at 89-93, 255-56.

c. *Validity*

We note that Aspen did not dispute that Ramamurthi discloses the additional limitation recited in claim 5.[10] *See* ID at 116. The ID concluded that Ramamurthi does not anticipate claim 5 only because Ramamurthi does not anticipate the "lofty batting" limitation in claim 1 of the '359 patent. *See id.* at 117. Since the Commission affirms with modifications the ID's finding that claim 1 has not been shown to be invalid, the Commission also affirms with modifications the ID's finding that Ramamurthi does not anticipate claim 5 of the '359 patent.

iii. Claims 7 and 9 of the '359 Patent

Claim 7 requires that the "composite article" of claim 1 comprises a "dopant" and claim 9 requires that "the dopant is present in an amount of about 1 to 20% by weight of the total weight of the composite." The ID found (i) Aspen has proven that Respondents have infringed these claims; (ii) Aspen has shown that certain of its Cryogel, Pyrogel, and Spaceloft products practice these claims; and (iii) Respondents have not shown that these claims are invalid. On review, the Commission affirms the ID's findings with respect to claims 7 and 9 of the '359 patent.

a. *Claim Construction*

In its petition for review, the IA asserts that "[a]lthough the parties disputed the meaning of the claim term 'of about 1 to 20%' recited in claim 9," the ID errs in not construing this term. IAPet at 26. The Commission determined to review this issue and the ID's associated findings

[10] Ramamurthi discloses use of fibers that have a thermal conductivity less than 50 mW/m-K. IAPet at 21-22 (citing Tr. (Gnade) at 673:11-674:5; RX-11 at 4:25-38 (examples of preferred fibers are glass wool with a thermal conductivity of 42 mW/m-K or rock wool, which has a thermal conductivity of 37 mW/m-K which may be in the form of individual fibers, bundles of fibers, mats or sheets, woven or unwoven)).

on infringement, the technical prong of the domestic industry requirement, and validity. In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 1. Please address the proper scope of claim 9 of the '359 patent and, in particular, the "about 1 to 20%" limitation. Your response should be limited to the evidence in the record, including a discussion of relevant statements, if any, made in the prosecution history.

In response to the Commission's notice, all of the parties agree that the word "about" does not have a universal meaning in patent claims, but instead depends upon the technological facts of the particular case. *See, e.g.*, IASub at 6 (citing *Ortho-McNeil Pharm., Inc. v .Caraco Pharm. Labs., Ltd.*, 476 F.3d 1321, 1326 (Fed. Cir. 2007)). The parties also agree that the use of the word "about," however, avoids a strict numerical boundary to the specified parameter. *Id.* Respondents and the IA argue that the "about 1 to 20%" limitation is properly construed to encompass a dopant present in an amount greater than zero, but less than twenty-one (21), percent. IAResp at 10; IASub at 8; NanoPet at 26; RespSub at 2. By contrast, Aspen argues that the term "about" should be given its plain and ordinary meaning of "approximately," and that the claim language "'about 1%' does not extend down to zero." AspenSub at 4-5.

Although the ID does not expressly construe the "about 1 to 20%" limitation in claim 9, the ID appears to reject Respondents' and the IA's proposed construction that allows any amount of dopant above zero and below 21%. *See* ID at 117 (finding that Respondents' expert "provided no evidence or plausible rationale why the disclosed opacifier cannot be more than 0% but less than 'about 1%.'").

The Commission finds Aspen's proposed construction is supported by the intrinsic evidence and more closely aligned with the principles of *Phillips*. The '359 patent specification teaches that "[s]uitable amounts of such dopants generally range from about 1 to 20% by weight of the finished composite, preferably about 2 to 10%." JX-7 at 6:15-17. The specification also

describes several embodiments of composite articles with dopants ranging from 5% to 10% by weight of the composite article. *Id.* at 14:10-28 ("Sample C" includes 5% carbon black dopant by weight; "Sample D" includes 6% carbon black dopant by weight; "Sample E" includes 6% carbon black dopant by weight and 10% polydimethylsiloxane dopant by weight). Other than these references to dopant weights, the specification and the prosecution history provide no further description regarding dopants.

Respondents and the IA contend that the use of whole numbers to indicate percent weight of dopant in sample embodiments discussed in the '359 patent specification indicates that the patentees determined that precision to the tenths of a percentage point was not warranted, and that the term "about" contemplates variances on the order of at least a whole percentage point. RespSub at 3; IASub at 6-7. To the contrary, Aspen argues that "the specification explains that the 1% lower bound already includes a substantial tolerance over the preferred and intended range, which begins at 2%." AspenSub at 4. We find Aspen's argument more persuasive in view of the intrinsic evidence. As Aspen argues, the preferred embodiments described in the specification, which "[a]ll have dopants in amounts well above 1% by weight" "confirm that no large deviation below 1% were intended." *Id.*

We reject Respondents' proposed construction because it reads out the lower limit by redrafting the claim to read simply "below 20%." *Id.* at 3. Claim 7 already requires the presence of a dopant in the composite article, which necessarily means that the composite article of claim 7 has a dopant weight greater than zero. JX-7 at 14:63-64. Thus, construing the term "about 1[%]" broadly to encompass any dopant weight above zero, as proposed by Respondents and the IA, would render the "about 1[%]" term meaningless.

Respondents and the IA make three other arguments in support of their proposed construction, all of which the Commission rejects. First, Respondents argue that "there is nothing in the patent to indicate that the applicants viewed the lower limit as critical, or that there was anything inventive about a dopant in the amount of 1% as opposed to 0.5% or 0.1%. RespSub at 3. However, as discussed above, the specification does not teach using dopant weights far less than 1%. Rather, all of the embodiments described in the specification have dopant weights in amounts well above 1%. JX-7 at 14:10-28.

Second, relying on the testimonies of both Dr. Leventis and Dr. Gnade, the IA asserts that the extrinsic evidence "supports construing the range of 'about 1 to 20%' to mean greater than zero and less than 21 percent." IASub at 7 (citing Tr. (Leventis) at 1051:4-13; Tr. (Gnade) at 675:10-12). However, both experts' cited testimonies were in the context of whether Ramamurthi anticipates the claimed dopant range in claim 9; not the proper construction of the "about 1[%]" term. In fact, Dr. Gnade testified that "because of the role the dopant plays, you have to have some [and it] has to be at least 1 percent." Tr. at 675:8-10. Dr. Leventis testified that although Ramamurthi discloses the use of dopants, claim 9 is not anticipated by Ramamurthi because one of ordinary skill reading Ramamurthi would have been motivated to use dopants less than 1% or "way less than 1%" by weight. *Id.* at 1050:19-1051:16.

Third, the IA argues that, as reported to the government in Material Safety Data Sheets, some of Aspen's domestic industry products that practice claim 9 "can contain dopant in an amount greater than zero, but less than one percent," which is consistent with its proposed claim construction. IASub at 8. However, according to those datasheets, Aspen's domestic industry products contain dopant amounts within the range of 0-5%, which does not necessarily imply that they contain dopant amounts less than 1%. In fact, Complainant's expert testified that [redacted]

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[redacted]. Tr. (Leventis) at 351:12-352:13.

Thus, applying the principles articulated in *Phillips*, the Commission rejects Respondents' and the IA's argument that any dopant weight above zero percent is within the scope of claim 9. Rather, the claimed "about 1" percent is construed to include dopant amounts closer to 1 percent. The Commission need not provide a precise lower or upper boundary for the claimed range since resolving the parties' dispute does not require such precision as evident from the parties' infringement and validity arguments discussed below.

b. *Infringement*

In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 2. With reference to question one, please address whether Respondent Alison's accused products infringe claim 9 of the '359 patent under the proper construction of the "about 1 to 20%" limitation.

The Commission finds substantial evidence supports the ID's finding of infringement with respect to Alison.[11] [redacted]

[11] Aspen also accused certain Nano products of infringing claim 9 of the '359 patent. The ID found that Aspen showed that Nano's accused products meet the claimed range [redacted]. ID at 95-96. No party petitioned for review of this finding and there is no reason for the Commission to disturb this finding. [redacted]. *See* Tr. (Leventis) at 396:6-9.

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[redacted]

Tr. (Leventis) at 333:13-18, 336:9-19. The ID relied on Aspen's expert testimony to conclude that [redacted] consistent with claim 9. ID at 94 (citing Tr. (Leventis) at 333:21-337:7; JX-37C (Wei Dep.) at 27:8-10, 27:22-25)).

Alison makes a number of attorney arguments challenging Dr. Leventis's analysis. In particular, Alison argues that [redacted] as claim 9 requires. AlisonPet at 97. [redacted]

[redacted]

PUBLIC VERSION

Tr. (Leventis) at 383:5-24; *see also* Tr. (Leventis) at 394:1-16.

Alison also argues that "Aspen's expert did not testify

AlisonPet at 98 (citing Tr. (Leventis) at 383:9-24). However, as the IA argues, while Aspen's expert "did not include express calculations in his expert report, he testified that (i) the calculation is rudimentary, (ii) he performed the calculation, and (iii) he determined that

IAResp at 11 (citing Tr. (Leventis) at 381:5-383:24).

19 JUDGE MC NAMARA: Was there a reason that you

Tr. (Leventis) at 395:19-396:5; *see also id.* at 394:1-16.

PUBLIC VERSION

Alison further argues that [redacted]

Finally, Alison asserts that the ID erred in noting that Aspen's expert testimony was unrebutted since Alison rebutted Aspen's assertion in its post-hearing briefs. AlisonPet at 99; *see* Respondent Guangdong Alison Hi-Tech Co.'s Reply Post-Hearing Brief at 45, EDIS Doc ID 605641 (Mar. 15, 2017) ("AlisonRPHB"). But Alison did not challenge Dr. Leventis's testimony before the ALJ other than an attorney argument that Dr. Leventis's analysis *might* be flawed. Alison's experts, Dr. Gnade and Dr. Scherer, offered no testimony disputing Dr. Leventis's calculation or challenging his conclusion as to Alison's infringement of claim 9. AspenSub at 8 (citing Tr. (Gnade) at 729:23-730:10; Tr. (Scherer) at 971:7-9). Even now before the Commission, Alison cites no evidence to counter Dr. Leventis's opinion.

Thus, in view of the record evidence as a whole, the Commission affirms the ID's finding that Aspen has proven by a preponderance of the evidence that Alison's accused products [redacted] infringe claims 7 and 9 of the '359 patent.

c. *Validity*

In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 3. With reference to question one, please discuss whether Ramamurthi anticipates the limitation "the dopant is present in an amount of about 1 to 20% by weight of the total weight of the composite" in claim 9 of the '359 patent.

Having reviewed the record evidence and the parties' submissions, the Commission affirms with modifications the ID's finding that Ramamurthi does not anticipate or render obvious claim 9 of the '359 patent. The ID's analysis is consistent with our construction for the "about 1 to 20%" limitation in claim 9. Specifically, the ID found that Respondents have not shown by clear and convincing evidence that Ramamurthi anticipates claims 7 and 9 of the '359 patent for the same reasons discussed above in connection with claim 1 of the '359 patent. In addition, the ID found that Ramamurthi does not anticipate or render obvious the additional limitation recited in claim 9, namely, "the dopant is present in an amount of about 1 to 20% by weight of the total weight of the composite." ID at 116-117, 196-198. While Ramamurthi discloses the use of an opacifier as a dopant, the ID found that Ramamurthi does not disclose the amount of opacifier to use. *Id.* at 116. Relying on primarily the testimony of Aspen's expert, the ID found that one of ordinary skill in the art would "want as small an amount [of Ramamurthi's opacifier] as possible so you do not compromise the properties of the aerogel," which "means, if possible, below 1 percent, or way below 1 percent." *Id.* (quoting Tr. (Leventis) at 1051:4-13); *see also id.* at 197-198. The ID found Respondents' expert "provided no evidence or plausible

rationale why the disclosed opacifier cannot be more than 0% but less than 'about 1%.'" *Id.* at 117.

There is no question that Ramamurthi does not expressly disclose the use of dopants in any specific percentage amount. Respondents, however, contend that the additional limitation of claim 9 is inherently disclosed in Ramamurthi and/or obvious in view of Ramamurthi and knowledge of one of ordinary skill in the art. RespSub at 7-9. The IA does not agree with Respondents' inherency argument but agrees with Respondents that the limitation is obvious over Ramamurthi. IASub at 12-13. The Commission finds Respondents' and the IA's arguments unpersuasive as discussed below.

As an initial matter, it appears that Aspen does not dispute Respondents' assertion that both parties' experts "agreed that it was inherent that the amount of dopant would be less than 20%," RespSub at 7 (citing Tr. (Gnade) at 676:1-3; Tr. (Leventis) at 1252:8-21), and that "both testified that a person of skill in the art would add enough dopant to have an effect on the aerogel composite, while limiting the amount of dopant so that the dopant does not cause an undesired effect." NanoPet at 25 (citing ID at 116-117). Aspen's expert, Dr. Leventis, testified in his rebuttal expert report that he agreed with Dr. Gnade that an "opacifying dopant 'will be more than ***0%***' by weight . . . and also that it would be a small fraction that is much less than 20% [but that he] disagree[d] that it would necessarily or inherently be more than ***1%*** by weight." CX-2256C at Q246.

Nevertheless, Respondents and the IA have failed to present any evidence beyond attorney argument and "vague and speculative" expert testimony that Ramamurthi's dopant could be used in an amount "about 1-20% by weight." *See* ID at 197. In support of their argument that Ramamurthi discloses using dopants in "a suitable amount," Respondents cite to

the '359 patent's teaching that a "suitable amount of dopant" "generally range[s] from about 1 to 20% by weight of the finished composite." RespSub at 8. However, the asserted patent disclosure cannot be used to fill in the gaps in Ramamurthi's disclosure. *See, e.g., W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553 (Fed. Cir. 1983) ("To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.").

Respondents argue that "[w]hile Ramamurthi did not quantify the amount of dopant added, there was no need to; a person of ordinary skill in the art would have known to use an amount large enough to have the desired impact on the composite, and small enough to avoid any undesirable effect." NanoPet at 28; *see* RespSub at 8 (citing Tr. (Gnade) at 717:16-19 ("[A]n amount less than 1 or less than about 1 probably will not have the effect that you want."), 653:9-15 ("[Y]ou have to put in enough in order to make [the aerogel composite] more opaque or to change the optical properties. So there has to be some. It has to be more than zero. So we're going to put in a small amount or 1 percent.")). Dr. Gnade also later testified that the amount of dopant "has to be at least 1 percent." Tr. (Gnade) at 675:9-10. However, Dr. Gnade failed to provide any supporting evidence for his testimony. Dr. Gnade's conclusory testimony does not satisfy the standard for inherent disclosure. *Rexnord Indus. v. Kappos*, 705 F.3d 1347, 1355 (Fed. Cir. 2013) (Anticipation by inherent disclosure is "appropriate only when the reference discloses prior art that must necessarily include the unstated limitation.") (quoting *In re Omeprazole Patent Litig.*, 483 F.3d 1364, 1378 (Fed. Cir. 2007)).

Moreover, the ID found Dr. Gnade's testimony "purely speculative." ID at 117 (citing Tr. (Gnade) at 675:10-12, 675:23-676:1, 717:16-19, 719:20-22). The ID relied on Dr. Leventis'

testimony that the amount of dopant that Ramamurthi would have used is much less than 1% by weight. *Id.* at 116 (citing Tr. (Leventis) at 1051:4-13 ("you want as small an amount as possible so you do not compromise the properties of the aerogel. So small amount as possible means, if possible, below 1 percent, or way below 1 percent")); *see also* Tr. (Leventis) at 370:10-21; AspenSub at 9-10. There is no reason to disturb the ALJ's credibility determination.

Nor does the record evidence support a finding that Ramamurthi renders this claimed range obvious. For instance, "[w]hile it was known in the art to use some dopants in amounts over 1%, that is not true of the only dopants that are actually used in Ramamurthi—namely opacifiers." AspenResp at 41 (citing Tr. (Leventis) at 1051:1-13). In particular, Aspen's expert testified that one of ordinary skill would use "below 1 percent, or way below 1 percent" of opacifiers because larger amounts may "compromise the properties of the aerogel." *Id.* In view of the record evidence, the Commission finds no reason to disturb the factual findings made in the ID. Thus, in addition to the ID's finding that Ramamurthi does not disclose a "lofty" batting as recited in claim 1 (which claims 7 and 9 depend from), Respondents have not met their clear and convincing burden of proving that Ramamurthi anticipates or that Ramamurthi in combination with the knowledge of a person of skill in the art would render obvious the additional limitation of claim 9.

The ID provides an analysis of the secondary considerations of nonobviousness for the Asserted Patents following its conclusion that the evidence is insufficient to demonstrate that the Asserted Claims are invalid under 35 U.S.C. § 103. ID at 216-230. Since Respondents have not presented a *prima facie* case of nonobviousness with respect to the Asserted Claims, the Commission does not need to consider the secondary considerations factors on review. *See Otsuka Pharm. Co., Ltd. v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012) (finding no need

to address a district court's findings on objective evidence because the district court's finding that an accused infringer failed to prove *prima facie* obviousness was correct). Thus, the Commission takes no position on the ID's findings on secondary considerations of nonobviousness.

d. *Technical Prong*

No Respondent petitioned for review of the ID's technical prong findings with respect to claims 7 and 9 of the '359 patent. The IA petitioned for review on this issue solely because she believes the claims are invalid in view of Ramamurthi. However, since the Commission is affirming the ID's infringement and validity findings, the Commission also affirms the ID's finding that Aspen has shown that its domestic industry products practice claims 7 and 9 of the '359 patent.

iv. Claims 12, 15, and 16 of the '359 Patent

a. *Claim Construction*

Claim 12 of the '359 patent recites *inter alia* "a fibrous batting sheet . . . where the batting is sufficiently lofty that the cross-sectional area of the fibers of the batting visible in the cross-section of the composite is less than 10% of the total surface area of that cross section" (hereinafter "Surface Area Limitation").

The parties dispute the meaning of "the total surface area of that cross section" in claim 12. Aspen's expert, Dr. Leventis, testified that the total surface area of the cross section of the composite is calculated by multiplying its length by its width. ID at 98 (citing Tr. (Leventis) at 320:14-15). Respondents' expert, Dr. Gnade, testified that determining the total surface area of the cross section is "much more difficult," *id.* at 120, because "***there's lots of nooks and crannies and lots of open space***." *Id.* at 121 (quoting Tr. (Gnade) at 656:1-25). Thus, according to Respondents' expert, the total surface area of the cross section is "***a whole lot bigger than***

length times width." *Id.* The ALJ found the testimony of Respondents' expert more persuasive and concluded that "[g]iven the 'nooks and crannies' of an aerogel composite's surface, simply basing a calculation of the total surface area of the cross-section on the width, as Dr. Leventis did, is neither convincing nor supported by evidence." *Id.* at 122.

In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 4. Please address whether the Commission should adopt Dr. Gnade's interpretation or Dr. Leventis' interpretation of the "total surface area of that cross section" limitation in claim 12 of the '359 patent. Your response should be limited to the evidence in the record, including a discussion of relevant statements, if any, made in the prosecution history.

In response to the Commission's notice, Aspen argues that "Dr. Leventis's straightforward interpretation is the only one that is consistent with the plain language of the term, the specification, and the practical realities in the art." AspenSub at 11. First, Aspen contends that "the plain meaning of 'total surface area of [the] ***cross section***' supports Dr. Leventis's interpretation" and that "Dr. Gnade conflates the surface area of a three-dimensional ***block*** of aerogel material with the two-dimensional surface area of a two-dimensional ***cross section*** through it." *Id.* As Dr. Leventis testified, "the surface area of the aerogel" and "the surface area of the cross section" are "[t]wo totally different things." *Id.* at 12 (citing Tr. (Leventis) 386:9-12). "The former is 'the internal surface area of a spongy material' while the latter is the 'cross section' that results when '[y]ou cut something.'" *Id.* (citing Tr. (Leventis) 386:12-16). According to Aspen, "a ***cross section*** of a sponge, an aerogel, or any other porous material . . . is by definition a slice through the block, Tr. (Leventis) at 320:3-8; Tr. (Gnade) at 797:22-24, and is thus a two-dimensional rectangle, Tr. (Leventis) at 320:9-11." *Id.* By contrast, Aspen agrees with Dr. Gnade that "a ***block*** of aerogel has a large surface area; indeed, there is

'about as much surface area as a football field ... in one gram of [aerogel] material.'" *Id.* at 12 (citing Tr. (Gnade) at 657:16-18; *see also* ID at 122).

Second, Aspen argues that "Respondents admitted that this would be an empty limitation under Dr. Gnade's interpretation, and that '[b]ecause of that large surface area of an aerogel, the fibers seen in a cross-sectional area will ***never*** be more than 10 percent of the total surface area.'" *Id.* at 13 (citing Tr. (Nano Counsel) at 77:7-9). Moreover, Aspen argues that "Staff has calculated that it is ***physically impossible*** for an aerogel composite not to meet the limitation under Dr. Gnade's interpretation because it would allow for a thousand times more fiber to be present in a cross-section than the entire size of that cross section." *Id.*

Third, Aspen argues that Dr. Gnade's interpretation contradicts the '359 patent specification, "which says that certain aerogel fiber arrangements (specifically mats) ***do*** have more than 10% cross-sectional fiber area: 'In an aerogel composite prepared with a mat reinforcement, the cross sectional surface area of the mat fibers is about ***30 to 50% of the total surface area of the cross section***.'" *Id.* at 13-14 (citing JX-7 at 8:2-5 (emphasis added)). Aspen contends that Dr. Gnade's interpretation further contradicts the specification "because he admits that it is impossible as a practical matter to determine" the cross-sectional area even though the patent "has no difficulty measuring and reporting the cross-sectional fiber density of its samples." *Id.* at 14 (citing Tr. (Gnade) 656:1-23; JX-7 at 14:1-3 ("Sample A used a less than 2 denier lofty polyester batting where ***the cross-sectional area of fibers was less than 15%*** of the total cross-sectional area of the aerogel composite ...." (emphasis added))).

Respondents argue for the adoption of Dr. Gnade's interpretation of "total surface area of the cross section" in claim 12 because it is "consistent with (1) the plain claim language itself; (2) the specification; and (3) the inventor's testimony." RespSub at 12. In particular,

Respondents contend that Dr. Gnade's interpretation "properly takes into consideration ***all*** of the surface area visible in a cross section of an aerogel composite – just as the limitation requires." *Id.* at 11 (citing Tr. (Gnade) at 656:1-25 (explaining that "there's lots of nooks and crannies" in aerogel that must be taken into account as part of the total surface area)). Respondents assert that in the case of an aerogel, total surface area of a cross section includes "all the surface that's exposed" as explained by Dr. Gould, Aspen's corporate representative and an inventor of the '359 patent. *Id.* at 12 (quoting Tr. (Gould) at 95:11-12). By contrast, Respondents assert that under Dr. Leventis's interpretation, a cross section of any material will have the same total surface area. *Id.* at 10.

Respondents also assert that the only discussion of surface in the '359 patent specification relates to the large surface area (often 900 m^2/g or higher) of aerogels. *Id.* at 11-12 (citing JX-7 at 1:38-41). Respondents contend that Dr. Gnade did not testify that the fibers could never be more than 10% of the total surface area. *See* RespReply at 9-10. Rather, Respondents argue that "Dr. Gnade's interpretation is consistent with the statements in the specification: if the thermal properties of a pure aerogel are to be retained in a composite aerogel, the fibers in the cross section must be less than 10% of the total surface area of the cross section." *Id.* at 10-11 (citing Tr. (Gnade) at 677:4-12). Respondents argue that the "fact that many aerogel composites, particularly aerogel composites with a low thermal conductivity, might meet this limitation does not establish that Dr. Gnade's interpretation is incorrect." *Id.* at 10.

The IA argues that Dr. Leventis's interpretation improperly "construes 'the total surface area of that cross section in claim 12' to mean the *area* of the cross section." IASub at 14. The IA asserts that "the express claim language requires comparing the '*area*' of the fibers in the cross section to the '*total surface area*' of the composite's cross section." *Id.* at 15. According to

the IA, the "area and surface area of a non-porous material, such as the fibers in the aerogel composite's cross section, will be the same," *id.*, but "[d]ue to their extreme nano-porosity, there is a difference between (i) the way the *area* of a cross section of aerogel is calculated and (ii) the way the *surface area* of that cross section is determined." *Id.* at 16. The IA contends that "both Drs. Gnade and Leventis testified that there is a special method used to determine the *surface area* of an aerogel's cross section." *Id.* (citing Tr. (Gnade) at 677:19-678:9 (BET is a technique for determining the surface area of an aerogel, which can be as high as 900 meters squared per gram), 797:20-799:15 (an aerogel can have a surface area of 900 meters squared per gram; uniquely large surface area of aerogels is one reason for their unique properties); Tr. (Leventis) at 376:11-23 (aerogels are famous for their high surface areas and special techniques are used to measure an aerogel's surface area); *see also* RX-11 (Ramamurthi) at 12:45-46 (monolithic aerogels have typical BET surface areas in the range of 5-800 meters squared per gram)).

The Commission finds that the intrinsic evidence does not provide a clear indication as to what is meant by the claim language "total surface area of that cross section" in claim 12 of the '359 patent. However, in view of the extrinsic evidence as a whole, the Commission finds Dr. Leventis' interpretation more persuasive and consistent with the intrinsic record. Therefore, the Commission modifies the ID's construction of the Surface Area Limitation in claim 12.

The specification teaches that "[a]erogels describe a class of material based upon their structure, namely low density, open cell structures, ***large surface areas*** (often 900 m^2/g or higher) and sub-nanometer scale pore sizes." JX-7 at 1:38-41 (emphasis added). Both parties' experts agree that the "surface area" of aerogels is not calculated simply by multiplying length

times width and that "specialized" testing and equipment are used to calculate it.[12] *See* Tr. (Leventis) at 376:11-23; Tr. (Gnade) at 656:1-25. Both parties' experts also agree that the term "cross section" has no special meaning in the context of the patent and that a person of ordinary skill in the art would understand the meaning of a "cross section" of an aerogel to result from "a slice through the block," and, thus, is a two-dimensional rectangle. Tr. (Leventis) at 320:3-11; *see* Tr. (Gnade) at 797:22-24; IASub at 15.

Respondents focus their arguments on the significance of the claim language "total surface area" and rely on evidence of the undisputed high surface areas of aerogel composites to support Dr. Gnade's interpretation. *See, e.g.*, RespSub at 11-12 ("the '359 patent states that aerogels often have large surface areas of 900 m^2/g or higher"), 12 ("This surface area takes into account the ***total*** surface area of the aerogel, including all of the surface that is exposed."). However, those arguments ignore the fact that the claim refers to the "total surface area" of a "cross section of the composite" article and not to the "total surface area" of the composite article itself.

The IA argues there is a difference between the "area" and the "surface area" of a cross section of porous material like aerogels. *See, e.g.*, IASub at 16; IAReply at 8 ("That there is a difference in the meaning of 'area' and 'surface area' is also illustrated by the differing use of the terms in claim 12."). However, the specification appears to use the terms "area" and "surface

[12] The ID's characterization of Dr. Leventis' testimony on this issue is inconsistent. For example, the ID finds on the one hand that "both experts agreed that the surface area of a cross-section of an aerogel is not determined by multiplying length times width." ID at 119 (citing Tr. (Leventis) at 376:21-23; Tr. (Gnade) at 797:25-798:23). However, the ID also finds that "Complainant's expert, Dr. Leventis, interpreted the 'total surface area of the cross section' to be the length of the cross section multiplied by its width." *Id.* at 120. To the contrary, Dr. Leventis has consistently testified that the surface area of an aerogel is not computed by length times width, but that the surface area of a cross section of an aerogel composite is. *See* Tr. (Leventis) at 376:21-23, 320:14-15.

area" interchangeably when referring to the cross section of an aerogel composite. *See* JX-7 at 7:32-36 ("upon looking at a cross-section of a final aerogel composite, the cross-sectional **area** of the fibers is less than 10% of the total **surface area** of that cross section . . . ."), 8:2-4 ("In an aerogel composite prepared with a mat reinforcement, the cross sectional **surface area** of the mat fibers is about 30 to 50% of the total **surface area** of the cross section."), 14:1-3 ("Sample A used a less than 2 denier lofty polyester batting where the cross-sectional **area** of fibers was less than 15% of the total cross-sectional **area** of the aerogel composite . . . ."). Thus, there is no reason to believe that the patentees intended for the terms "area" and "surface area" to have different meanings in the context of a cross section of an aerogel composite.

Finally, no expert testified how to actually compute the total surface area of a cross section of a composite under Dr. Gnade's construction. Contrary to Respondents' assertion that "Drs. Gnade and Leventis testified that there is a special method used to determine the surface area of an aerogel's cross section," RespReply at 11 (citing Tr. (Gnade) at 677:19-678:9, 797:20-799:15; Tr. (Leventis) at 376:11-23)), Dr. Gnade admitted that he did not know how to make such a calculation, AspenSub at 14 (citing Tr. (Gnade) at 656:1-23). Dr. Gnade testified that there is a special technique called BET that can be used to measure the total surface area of bulk aerogel, which is different from the cross section of an aerogel composite. *See* Tr. (Gnade) at 677:19-678:9. However, there is no dispute that the patent discloses that the total surface area of a cross section of a composite can be measured. *See* JX-7 at 14:1-3 ("Sample A used a less than 2 denier lofty polyester batting where the cross-sectional area of fibers was less than 15% of the total cross-sectional area of the aerogel composite . . . ."). Calculating "the total surface area of that cross section" by multiplying its length by width, as proposed by Dr. Leventis, is one reasonable interpretation. Accordingly, the Commission finds Dr. Leventis' interpretation of

"the total surface area of that cross section" is supported by substantial evidence and consistent with the intrinsic evidence.

b. *Infringement and Technical Prong*

In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 5. With reference to question four, please address whether Respondents' accused products and Aspen's domestic industry products meet the limitation "where the batting is sufficiently lofty that the cross-sectional area of the fibers of the batting visible in the cross-section of the composite is less than 10% of the total surface area of that cross section" under both Dr. Gnade's interpretation and Dr. Leventis' interpretation of the scope of claim 12 of the '359 patent.

As discussed above, the Commission construes claim 12 according to Dr. Leventis's interpretation of "the total surface area of [a] cross section" of the aerogel composite as its length times its width. Applying this construction, the Commission affirms the ID's finding that Aspen has proven that two of Respondent Nano's accused products infringe claims 12, 15, and 16 of the '359 patent. ID at 97-101. Respondents did not challenge Aspen's assertion that, under Dr. Leventis's interpretation, these products infringe these claims. *See* RespSub at 14. With respect to claim 12, the ID found that Aspen's expert used x-ray tomography data to compute "the percentages of the cross-section occupied by fiber and aerogel" and compared the percentages with the surface area of the cross-section, which he computed by multiplying length by width of the cross-section. ID at 98 (citing Tr. (Leventis) at 319:18-325:25). Moreover, the ID found Respondents' expert testified that "it is not possible to have the cross-section of the visible fibers in an aerogel composite exceed 10% of an aerogel composites surface area." *Id.* at 99 (citing Tr. (Gnade) at 678:10-22).

Applying Dr. Leventis's interpretation of claim 12, the Commission also affirms the ID's finding that Aspen has shown that two of its domestic industry products practice claims 12, 15,

and 16 of the '359 patent. *Id.* at 259-62. Respondents did not dispute that Aspen's products practice these claims or petition the Commission to review the ID's finding that they do. *See* RespSub at 14; AspenSub at 16.

c. *Validity*

The ID found that Respondents have not shown by clear and convincing evidence that Ramamurthi anticipates claims 12 and 15 of the '359 patent and that Ramamurthi in combination with Japanese Patent Publication No. H08-34678 ("Sonoda") renders obvious claim 16 of the '359 patent. ID at 117-125, 201-204. Specifically, the ID found that the asserted prior art does not disclose the following claim limitations:

- a fibrous batting sheet that is "lofty" or "sufficiently lofty" (all Asserted Claims);
- "a continuous aerogel through said batting" (all Asserted Claims);
- "the cross-sectional area of the fibers of the batting visible in the cross-section of the composite is less than 10% of the total surface area of that cross section" (claims 12, 15, and 16); and
- "the batting is compressible by a minimum of 50% of its thickness and is sufficiently resilient that after compression for about 5 seconds it returns to at least 70% of its original thickness" (claim 15).

Id.

In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 6. With reference to question four, please discuss whether Ramamurthi anticipates the limitation "the cross-sectional area of the fibers of the batting visible in the cross-section of the composite is less than 10% of the total surface area of that cross section" in claim 12 of the '359 patent.

The IA argues that "Ramamurthi anticipates claim 12 because it inherently teaches that the ratio of the cross-sectional area of fibers in a cross section of the composite cannot exceed ten percent of the cross-section's surface area due to the large surface areas present in aerogels."

IASub at 20 (citing Tr. (Gnade) at 676:4-678:9, 690:7-21). Respondents make the same argument. *See* RespSub at 16-17. Respondents also point out that "if the fiber content were more than 10% of the total surface area of the aerogel composite, the aerogel composite would have so much fiber that the thermal conductivity would increase significantly." *Id.* at 16 (citing Tr. (Gnade) at 677:9-12. Respondents contend that "because the aerogel composite disclosed in Ramamurthi retained the excellent thermal properties of aerogel, the cross-sectional area of the fibers of the batting disclosed in Ramamurthi must necessarily be less than 10% of the total surface area of that cross section." *Id.* at 16-17.

Aspen contends that Respondents have not argued that "Ramamurthi anticipates this limitation under Dr. Leventis's interpretation and cannot satisfy their heavy burden of proving by clear and convincing evidence that Ramamurthi anticipates under Dr. Gnade's interpretation." AspenSub at 19. Aspen asserts that "[r]ather than apply either of these constructions in accordance with the Commission's request, Respondents repeat their conclusory argument that Ramamurthi's aerogel composites necessarily meet the limitations of claim 12 because they had good thermal conductivities." AspenReply at 13-14.

Aspen contends Respondents' argument fails for three reasons. First, Aspen argues that "Respondents have not proven any objective relationship between the thermal conductivity of an aerogel composite and the percent of visible fibers in a cross section of that composite." *Id.* at 14. According to Aspen, "[n]or have Respondents proven that Ramamurthi discloses a particular thermal conductivity that inherently (*i.e.*, necessarily) results in an aerogel composite that meets the limitations of claim 12." *Id.* Second, Aspen asserts that Respondents' inherency argument "is flatly contradicted by the express teachings of the '359 patent," which "discloses an aerogel composite that has a low thermal conductivity and a 'cross-sectional area of fibers [that] was less

than ***15% of the total cross-sectional area of the aerogel composite***.'" *Id.* (quoting JX-7 at 14:1-5 (emphasis added)). Third, Aspen argues that "Respondents attempt to buttress their inherency argument with false equivalencies between Ramamurthi's aerogel composites and those disclosed in the '359 patent." *Id.* at 15. According to Aspen, however, "the inventions of the '359 patent allow for aerogel composites with far lower thermal conductivities than those disclosed in Ramamurthi and the '359 patent expressly distinguishes Ramamurthi on this basis." *Id.* (citing JX-7 at 2:14-21).

As explained below, the Commission affirms with modified reasoning the ID's finding that Ramamurthi does not anticipate the Surface Area Limitation of claim 12. The Commission adopts the ID's other findings with respect to the validity of claims 12, 15, and 16 that are not inconsistent with our analysis below and the Commission's construction of claim 12 (*see supra* at section II(A)(iv)(a)).

As an initial matter, there is no dispute that Ramamurthi fails to expressly disclose the Surface Area Limitation. Moreover, Respondents fail to present sufficient evidence to support their argument that Ramamurthi inherently discloses the Surface Area Limitation. First, Respondents improperly rely on teachings from the '359 patent to purportedly show that Ramamurthi's aerogel composites necessarily meet the Surface Area Limitation because they have good thermal conductivities. *See* RespSub at 15-16; *W.L. Gore & Assocs., Inc.*, 721 F.2d at 1553 ("To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.").

Second, the conclusory statements of Respondents' expert are insufficient to support Respondents' inherency argument and are refuted by the '359 patent. RespSub at 16; AspenReply at 14-15. Specifically, Dr. Gnade testified:

> Q Do you have an opinion on whether Ramamurthi shows the claimed limitations of claim 12?
> A My opinion is that it does, because with the very large surface areas that you have in these cross sections, because of the inherent cross-sectional area or the huge surface area for the aerogels, I think if you got anywhere close to 10 percent of the total surface area of that cross-section, you would have so much fiber that the thermal conductivity would start to go up significantly.
> I mean -- so you really are trying to put in just enough fiber to give you all the other properties you want. And if you got above 10 percent of the total surface area -- and the claim is pretty clear about calling out total surface area, you know. It says the total surface area of that cross-section.

Tr. (Gnade) at 677:4-18. However, the '359 patent "discloses an aerogel composite that has a low thermal conductivity and a 'cross-sectional area of fibers [that] was less than ***15% of the total cross-sectional area of the aerogel composite***.'" AspenReply at 14 (quoting JX-7 at 14:1-5 (emphasis added)). Notably, "the thermal conductivity of this aerogel composite is equal to or *lower* than that disclosed in Ramamurthi." *Id.* (citing *Compare* JX-7 at Fig. 7 (showing thermal conductivities of Sample A), *with* RX-0011 (Ramamurthi) at 2:15-22 (describing thermal conductivities between 0.018 to 0.020 W/mK)). There is no evidence of any objective relationship between the thermal conductivity of an aerogel composite and the percent of visible fibers in a cross section of that composite. *Id.* Nor have Respondents proven that Ramamurthi discloses a particular thermal conductivity that inherently results in an aerogel composite that meets the Surface Area Limitation. *Id.* Accordingly, Respondents have not met their burden of proving that Ramamurthi anticipates claim 12.

Finally, the Commission takes no position on the ID's findings on secondary considerations of nonobviousness with respect to claim 16 of the '359 patent. *See Sandoz*, 678 F.3d at 1296 (finding no need to address a district court's findings on objective evidence because the district court's finding that an accused infringer failed to prove *prima facie* obviousness was correct).

B. THE METHOD PATENTS

With respect to the Method Patents, the Commission affirms with modifications the ID's finding that claim 15 of the '123 patent and claims 11-13, 15, 17, and 21-23 of the '890 patent are not obvious in view of Ramamurthi and either Uchida or Yada. As with the '359 patent, the Commission takes no position on the ID's findings on secondary considerations of nonobviousness. The Commission did not review the ID's findings that Respondents' accused manufacturing processes directly infringe the asserted claims of the Method Patents and that Aspen's domestic industry manufacturing process practices certain claims of the Method Patents. *See* ID at 42-80, 231-250. The Commission also did not review the ID's other findings with respect to the validity of the asserted claims of the Method Patents. Thus, the Commission affirms the ID's finding of a violation of section 337 by both Respondents in connection with claims 15-17, and 19 of the '123 patent; and claims 11-13, 15, 17-19, and 21 of the '890 patent.

i. Claim 15 of the '123 Patent and Claims 11-13, 15, 17, and 21-23 of the '890 Patent

a. *Aspen's contention that Respondents' petitions for review raise new arguments and new evidence concerning Uchida and Yada*

Aspen argues that Respondents' petitions for review raised the following new arguments:

- that a person of ordinary skill in the art would recognize that Uchida's dryer would not be necessary in making gel sheets and thus the combination of Ramamurthi and Uchida taught the claimed step of "dispensing onto a moving element" AlisonPet. at 78 (citing Tr. (Scherer) at 990:5-22));

- that a person of ordinary skill in the art would understand how to use Yada's rollers to introduce fibrous batting material onto a moving element, thereby rendering obvious the step of "providing a fibrous batting material" in claim 13 of the '890 patent (*id.* at 80 (citing Tr. (Scherer) at 1017:8-13));

- that the ALJ erred by accepting the testimony of Aspen's expert that sol would "fall through the holes [of Uchida's mesh belt] onto the floor" (*id.* at 77 (quoting Tr. (Schiraldi) at 1194:10-16)); and

- that a person of ordinary skill would know that Uchida's vacuums could "help draw the liquid in and saturate [the fibrous batting]" (*id.* at 78 (citing Tr. (Scherer) at 988:16-19)).

RespSub at 17; *see* AspenSub at 23-25.

In its November 30, 2017 notice of review, the Commission asked the parties to address the following:

> 7. Please address Aspen's contention in its combined response (at 82-84) that Respondents' petitions for review presents new arguments and new evidence concerning Uchida and Yada that they failed to raise in their post-hearing briefs.

In its response to the Commission's notice, the IA argues that "[w]hether waiver has occurred is not dependent upon a specific citation to every possible portion of the record, or a strict requirement addressing every subspecies of argument, in post-hearing briefs, but whether the contention has been clearly made before the ALJ, is present in the record certified to the Commission, and at least within the scope of arguments that appear in post-hearing briefs." IASub at 21. As discussed below, Respondents' alleged new arguments and new evidence concerning Uchida and Yada are reasonably within the scope of arguments that they made in their post-hearing briefs, contrary to Aspen's assertion.

Aspen asserts that Respondents argue, "for the first time, that 'a person of ordinary skill in the art of aerogels would know not to use Uchida's dryer' by applying 'common sense and ordinary creativity.'" AspenSub at 23 (citing AlisonPet at 78). Aspen also asserts that

Respondents argue "for the first time, that Uchida's vacuums could actually 'help draw the liquid in and saturate [the batting].'" *Id.* at 24 (citation omitted). There is no dispute that Respondents' post-hearing briefs do not expressly make the disputed arguments regarding Uchida's dryers and vacuums. *See* IASub at 22, 23; RespSub at 19. However, Respondents' post-hearing briefs "argued that Uchida and Yada should not be limited to the specific structures described in the preferred embodiments but instead should be read for what the references as a whole would have taught a person of ordinary skill in the art." RespSub at 19; *see* IASub at 22, 23. In their petitions for review, Respondents made nearly identical arguments in criticizing the ID for its narrow interpretation of the prior art:

> [I]t was error for the ALJ to demand a literal substitution of Uchida's disclosed equipment in combining that reference with Ramamurthi . . . Rather, the ALJ was required to consider what Uchida as a whole would have taught to a person of ordinary skill in the aerogel field . . . Instead of following the law, the ALJ focused exclusively on the specific embodiments in Uchida, such as the mesh belt, the dryer, and the vacuums. *See* ID at 177.

NanoPet at 71. Moreover, the expert testimony cited in Respondents' petitions for review in support of their arguments regarding Uchida's dryers and vacuums is present in the record. *Id.* at 70 (citing Tr. (Scherer) at 990:5-22), 71 (citing Tr. (Scherer) at 988:16-19). Thus, the Commission finds that Respondents' arguments regarding Uchida's dryers and vacuums is within the scope of arguments raised in Respondents' post-hearing briefs.

Aspen further asserts that Respondents argue for the first time "that the independent claims of the Method Patents would have been obvious because 'Dr. Scherer clearly explained how a person of ordinary skill would have replaced Yada's plastic film on rollers 10' with a roll of fibrous batting as taught by Ramamurthi.'" AspenSub at 24 (citing AlisonPet at 80). However, Respondents "raised this issue in their initial posthearing briefs, citing the same expert testimony from the hearing that is cited in Respondents' Petitions." IASub at 22 (citing

Respondent Guangdong Alison Hi-Tech Co.'s Initial Post-Hearing Brief at 86, EDIS Doc ID 605106 (Mar. 8, 2017) ("AlisonPHB") ("For example, a POSA could easily fashion a process whereby Ramamurthi's mats or sheets (*i.e.*, fibrous batting) are on the conveyor belts disclosed by the prior art, and the sol is dispensed onto it (for example, as taught by Nakanishi or Yada).") (citing Tr. (Scherer) at 1017:40-13)). Thus, we find Respondents' argument in their petitions for review is not new. *See* RespSub at 18-19.

Finally, Aspen asserts that Respondents' argument addressing Uchida's mesh belt in their petitions for review is new. However, Respondents disputed Aspen's arguments concerning the Uchida mesh belt in both their post-hearing and post-hearing reply briefs. IASub at 23. In particular, Respondents explain that "[w]hile Aspen previously criticized Uchida's teaching of a mesh belt, its expert conceded that the moving element recited by the asserted claims could include a mesh belt—like that in Uchida." RespSub at 18 (citing AlisonPHB at 65). Respondents also argued that Uchida's mesh belt could be used to practice the claims' limitations. *Id.* (citing AlisonRPHB at 29). Thus, the Commission finds this argument is also not new and has not been waived.

b. ***Validity of claim 15 of the '123 patent and claims 11-13, 15, 17, and 21-23 of the '890 patent in view of Ramamurthi and Uchida or Yada***

The two steps recited in claim 15 of the '123 patent are nearly identical to the first two steps recited in claim 11 of the '890 patent. *See supra* at 10. Specifically, claim 15 of the '123 patent recites "dispensing a catalyzed sol onto a moving element as a continuous sheet" while claim 11 of the '890 patent recites "dispensing a sol onto a moving element as a continuous sheet." Because there is no dispute that Ramamurthi discloses both a "sol" and a "catalyzed sol," the parties and the ID treated the "dispensing" steps in both claims identically for purposes of

invalidity. *See, e.g.*, ID at 188-189; NanoPet at 43. Both claims also recite the step of "rolling the dispensed sheet into a plurality of layers." *Supra* at 10.

The ID found that "[f]or over ***seventy years*** before Aspen's discovery of the claimed continuous processes, 'batch casting methods like those disclosed in Ramamurthi were the exclusive means for manufacturing' aerogels due to the extremely delicate nature of these materials and the gels used to create them."[13] AspenResp at 53 (citing ID at 1, 173; *see also* Tr. (Schiraldi) at 416:5-12, 1167:23-25; JX-23). Respondents' expert agreed "that batch casting methods [like Ramamurthi's] and continuous casting methods [like the Method Patents'] represent 'two extremes.'" ID at 169 (citing Tr. (Scherer) at 961:12-21); *compare* RX-11 at 7:27-49, 12:14-16 (Ramamurthi disclosing batch casting process for forming both rigid and flexible gel samples) *with* JX-6 at 2:29-33 (the '123 patent explaining that the disclosed continuous and semi-continuous casting methods "are greatly improved over conventional batch sol-gel casting methods for gel sheets, fiber-reinforced flexible gel sheets, and rolls of composite gel materials.").

Based on the record evidence, we agree with the ID's finding that "Respondents cherry-picked the few aspects of [Uchida and Yada] that look similar in hindsight to the disclosures of the Method Patents." ID at 189. As the Supreme Court explained in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007), an invention "composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in

[13] Like the '359 patent, Ramamurthi was not only before the PTO examiner, but it was discussed during prosecution of the Method Patents and distinguished in the common patent specification. AspenResp at 53 (citing JX-6 at 2:19-25; JX-9 at 2:18-25). The PTAB also considered Ramamurthi in a Petition filed by Respondent Alison seeking *inter partes* review of claims 15-17 and 19 of the '123 patent and claims 11-13, 15, 17-19, and 21 of the '890 patent. CX-2269 at 2; CX-2270 at 2. However, Respondent Alison did not assert any grounds of unpatentability based on Ramamurthi in combination with Uchida or Yada. The PTAB determined to deny institution of an *inter partes* review of both patents. *Id.*

the prior art." Rather, "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *Id.* (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). A determination of obviousness cannot be reached where the record lacks "explanation as to *how* or *why* the references would be combined to produce the claimed invention." *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016).

Respondents contend that "a person of ordinary skill in the aerogel field would have been motivated to produce gel sheets (as taught by Ramamurthi) on a commercial scale using a continuous process (as taught by Uchida and Yada). NanoPet at 45. However, as the ID found, Respondents point to only continuous processes used in manufacturing completely different, much stronger, materials; namely, "Uchida's thermoplastic resins (used, e.g., as desktop organizers) and Yada's high impact strength acrylic polymers," as alleged evidence of obviousness of the claimed method steps. AspenResp at 54; *see* ID at 174-175. Substantial evidence supports the ID's finding that Uchida's thermoplastic resin and Yada's high impact strength acrylic polymers are chemically very different from the extremely fragile aerogels and the gels used to create aerogels.[14] *See* ID at 175. In particular, "as a sol turns into a gel, a three-dimensional lattice forms with internal structures that are around the size of a nanometer." AspenResp at 56 (citing Tr. (Schiraldi) at 406:11-19; Tr. (Gould) at 94:1-12); *see* ID at 173. It is undisputed that this structure is very fragile. *See* ID at 173; NanoPet at 69 (citing Tr. (Schiraldi) at 1175:11-15).

Respondents assert that "it was undisputed that the sol being dispensed onto the moving element is not" fragile and Ramamurthi's fiber-reinforced aerogels are not fragile. NanoPet at

[14] Aspen points out that Respondents' assertion that Uchida is directed to "gel sheets" is false because Uchida does not disclose gels in the first instance, as Respondents' own expert testified. AspenResp at 86 (citing Tr. (Scherer) at 898:11-16); *see also* ID at 180.

66. Respondents' assertion is disingenuous because it focuses on the strength of materials *before* the sol-gel process begins and *after* it ends, while ignoring the critical time period in between when the fragile three-dimensional lattice structure is being formed. AspenResp at 74 (citing Tr. (Scherer) at 959:24-960:2). Based on the record evidence, we find no error in the ID's conclusion that "[a]fter 70 years of making these materials in stationary molds [as taught for example in Ramamurthi], using a continuous process would have been counterintuitive because it would have been expected to impose additional stresses and damage the sol-gel structures." ID at 173 (citing Tr. (Schiraldi) at 417:3-418:9, 1175:1-1176:4).

Moreover, Respondents have not proven by clear and convincing evidence that a person of ordinary skill in the art would have had a reasonable expectation of success in achieving the claimed process for "preparing gel sheets" by combining the teachings of Ramamurthi with those of Uchida or Yada. Establishing obviousness through a combination of prior-art references requires showing that a person of ordinary skill in the art would have had a reasonable expectation of success in achieving the benefits of the claimed invention when combining the teachings of the prior art. *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016). The record evidence supports the ID's finding that "Uchida's system—*i.e.*, the mixer, the mesh belt (which Respondents point to for the "moving element" limitation), and vacuums—would have been ***harmful*** in manufacturing Ramamurthi's aerogel composites." AspenResp at 60 (citing ID at 177 (citing Tr. (Gould) at 99:17-24; Tr. (Schiraldi) at 1194:4-19; Tr. (Scherer) at 988:21-989:5, 990:5-22)).

Likewise, Aspen argues that "Yada uses ultraviolet lamps to facilitate polymerization, cooling systems, and an air-tight chamber, all of which are equipment that would be unnecessary for manufacturing Ramamurthi's composites." *Id.* at 61-62 (citing Tr. (Schiraldi) at 1199:1-16).

Given the very different nature and chemistries between the materials disclosed in Ramamurthi and those disclosed in Yada and Uchida, the ID correctly found that Respondents' analysis suffer from hindsight bias and that, prior to the inventions of the Method Patents, a person of ordinary skill in the art would have had neither the motivation nor a reasonable expectation of success in manufacturing Ramamurthi's aerogel composites using a continuous process, including those disclosed in Uchida or Yada. *Id.* at 54 (citing ID at 168-92).

With respect to the "rolling" step, Aspen argues that Respondents "do not identify a single reference that discloses how to roll a gel sheet, much less a fragile gel sheet made from a 'sol,' relying instead on disparate materials like those disclosed in Uchida and toilet paper." *Id.* at 65. We find no reason to disturb the ID's finding that "the process for rolling Uchida's [thermoplastic resin] into a plurality of layers is very different than that for rolling Ramamurthi's materials into a plurality of layers." *Id.* at 64 (citing ID at 180). Respondents' bare argument that a person of ordinary skill in the art would have known how to combine the teachings of Ramamurthi with Uchida in a way that accomplished the "rolling" step because doing so was a matter of trivial design choice is not sufficient to carry their burden. *See* NanoPet at 50. Neither is Respondents' expert testimony that "rolling is simply 'a natural outcome," sufficient to carry Respondents' burden. *See id.* at 51 (quoting Tr. (Scherer) at 905:3-6); *In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017) ("Absent some articulated rationale, a finding that a combination of prior art would have been 'common sense' or 'intuitive' is no different than merely stating the combination 'would have been obvious.' Such a conclusory assertion with no explanation is inadequate to support a finding that there would have been a motivation to combine.").

The IA argues that claim 15 of the '123 patent and claim 11 of the '890 patent are drafted very broadly to cover methods for making gel sheets, which are not aerogels or aerogel

composites. *See* IAPet at 31. The IA also argues that the ID erred in construing the asserted method claims "as a product claim when the ID found that the Ramamurthi-Uchida combination does not produce Ramamurthi's composite aerogel." *Id.* at 37. First, we agree with Aspen that "it is inappropriate to fault the ALJ for addressing the very argument that Respondents had presented," *i.e.*, that "a POSA would have been motivated to produce Ramamurthi's fiber-reinforced aerogel sheets on a mass scale." AspenResp at 75 (citations omitted). Second, while the claims are drafted broadly to cover "gel sheets," the claims do cover methods for making aerogels and aerogel composites. That is because the common specification for the Method Patents uses the term "gel sheets" to include not only "sheets of catalyzed sol," as the IA contends, but also "fiber-reinforced flexible gel sheets" and "rolls of composite gel materials." JX-6 at 2:29-33. Respondents assert that "gel sheets do not become an aerogel until after supercritical drying." NanoPet at 66. However, dependent claim 12 of the '890 patent recites that the "drying" step of claim 11 "is accomplished using supercritical fluids." JX-9 at 14:3-4. Thus, claim 11's "method for preparing gel sheets" is part of the process for making aerogels.

Since Respondents have not presented a *prima facie* case of nonobviousness with respect to the asserted claims of the Method Patents, the Commission does not need to consider the secondary considerations factors on review. *See Sandoz*, 678 F.3d at 1296. The Commission takes no position on the ID's findings on secondary considerations of nonobviousness.

III. REMEDY, PUBLIC INTEREST, AND BONDING

A. Remedy

We have concluded above that Aspen has shown a violation of section 337 by both Respondents based on infringement of the Asserted Patents. Under the statute, if the Commission determines that a violation has occurred, "it shall direct that the articles concerned . . . be excluded from entry into the United States, unless, after considering the effect

of such exclusion upon the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers, it finds that such articles should not be excluded from entry." 19 U.S.C. § 1337(d)(1).

The RD recommends the issuance of a LEO with a certification provision because "whether any specific aerogel material or product infringes any of the patents, but particularly the '359 patent, would be impossible to detect by inspection." ID at 267. The RD recommends no issuance of a cease and desist order because Aspen has withdrawn its request for such an order. *Id.* at 266-267. Furthermore, the RD notes that the parties stipulated to a bond of 100% of the entered value of covered products during the period of Presidential review. *Id.* at 268.

i. Aspen's Proposed Certification Provision

Aspen acknowledges that "certification provisions have become standard in ITC exclusion orders so as to provide Customs and Border Protection [CBP] with flexibility in the enforcement of the order, as well as minimize any disruption to the legitimate importation of goods found to be non-infringing." AspenSub at 25. However, Aspen asserts that the "Commission and CBP have repeatedly stated that the certification provision is not to be used with respect to newly designed products or processes that a respondent may believe to be non-infringing." *Id.* at 25-26 (citing *Eaton Corp. v United States*, Slip Op. 05-121 at 22-25 (C.I.T. Sept. 9, 2005); *Certain GPS Devices and Products Containing Same*, Inv. No. 337-TA-602, Comm'n Op. at 19-20). Because the ID found that all of Respondents' accused products infringe at least one of the Asserted Claims, Aspen contends that "there were *no* adjudications of non-infringement upon which Respondents could rely to certify a product for entry into the United States." *Id.* at 26. As such, Aspen requests that the LEO state that "only products that have been

adjudicated as non-infringing by a court, the Commission, or CBP may be imported under the certification provision." *Id.*, Ex. 1, ¶ 3.

Respondents and the IA contend that there is nothing unique about this investigation that warrants anything other than use of a standard certification provision. RespReply at 17; IAReply at 10-11.

The Commission denies Aspen's request to depart from our standard certification provision. The standard certification provision does not allow an importer to simply certify that it is not violating the exclusion order as Aspen suggests. As the Commission has previously stated, CBP only accepts a certification that the goods have been previously determined by CBP or the Commission not to violate the exclusion order. *Certain Network Devices, Related Software and Components Thereof (I)*, Inv. No. 337-TA-944, Comm'n Op. at 53 n. 19 (Jul. 26, 2016).

Moreover, Aspen's request is contrary to the Commission's standard practice for the past several years to include certification provisions in exclusion orders to aid CBP.[15] *See, e.g.*, *Certain Mobile Devices, Associated Software, and Components Thereof*, Inv. No. 337-TA-744, Comm'n Op., 2012 WL 3715788 at *13 (June 5, 2012); *Certain Network Devices, Related Software and Components Thereof (I)*, Inv. No. 337-TA-944, Comm'n Op. at 53 (Jul. 26, 2016). Certification provisions are especially helpful to CBP "where the patent(s) that form the basis of the order cover processes for manufacturing goods and Customs is unable to readily to determine how goods sought to be imported were made." *Certain Abrasive Products Made Using a*

[15] Prior to this practice, the Commission refused to include certification provisions where the CBP could readily test any incoming product to determine if they are covered by our order and the evidence suggested that respondents were likely to falsify their certifications to CBP. *See Certain Neodymium-Iron-Boron Magnets, Magnet Alloys, and Articles Containing Same*, Inv. No. 337-TA-372, USITC Pub. 2964, Comm'n Op. at 10-12 (May 1996).

Process for Powder Preforms, and Products Containing Same, Inv. No. 337-TA-449, Commission Opinion on Remedy, the Public Interest, and Bonding, 2002 WL 31093610, at *3 (Jul. 26, 2002) (citing *Certain Acid Washed Denim Garments and Accessories,* Inv. No. 337-TA-324, Commission Op. at 23 (Aug. 14, 1992)). Aspen does not dispute the ID's finding that "whether any specific aerogel material or product infringes any of the patents, but particularly the '359 patent, would be impossible to detect by inspection." ID at 267.

In addition, the '359 patent expires several years before the Method Patents and certain accused products that infringe one or more asserted claims of the '359 patent do not infringe the Method Patents. Thus, it is conceivable that Respondents may use the certification provision to import non-infringing products after the expiration of the '359 patent. Further, there is no evidence that Respondents have operated in bad faith.[16] Therefore, the LEO will not include Aspen's proposed certification provision.

ii. Respondents' Proposed Non-Infringement Statements

Respondent Alison requests that any LEO should include specific statements of non-infringing products, as follows:

- that "Alison's [redacted] products do not infringe claims 7 and 9 of the '359 patent," ID at 3;
- that "Alison's products having a 'Z' designator in the product name are not subject to exclusion for the '123 and '890 patents" because "Aspen and Alison have stipulated the products [redacted] do not infringe any asserted claim of the '123 and '890 patents." JX-0028C (Stipulation between Aspen and Alison); *see* ID at 3-4; and

[16] The Commission required respondent in *Certain Opaque Polymers*, Inv. No. 337-TA-833, to obtain an advisory ruling from the Commission prior to importing allegedly noninfringing products in view of the respondent's pattern of deceit and spoliation of evidence in that investigation and complainant's allegation that the respondent did not make any products that might inadvertently get excluded. *See Certain Opaque Polymers*, Inv. No. 337-TA-883, Comm'n Op. at 23-24 (Apr. 30, 2015).

- that "Alison has not violated Section 337 for claims 12, 15, and 16 of the '359 patent."

RespReply at 17-18.

The Commission denies all of Alison's requests to carve out allegedly non-infringing products. The products that Alison's seeks to carve out do in fact infringe claim 1 of the '359 patent. *Supra* at section II(A)(i); ID at 26-27. In other words, even though Alison's [redacted] products do not infringe claims 7 and 9 of the '359 patent and Alison's products [redacted] do not infringe the Method Patents, those same accused products infringe claim 1 of the '359 patent. Moreover, Alison's requests would not be helpful to CBP's enforcement of the LEO given that Alison's [redacted] products and Aspen's products having a "Z" designator in the product name will be covered by the proposed LEO.

B. Public Interest

Section 337 defines a two-stage process for the Commission to act upon a complaint. The Commission first "determines, as a result of an investigation under this section" whether "there is a violation of this section." *See* 19 U.S.C. § 1337(d)(1). If the Commission determines a violation has occurred, the Commission "*shall* direct that the articles concerned . . . be excluded from entry into the United States unless after considering *the effect* of such exclusion" on four public interest factors the Commission determines a remedy should not issue. *Id.* (emphasis added). Those factors are: (1) the public health and welfare; (2) competitive conditions in the U.S. economy; (3) the production of competitive articles in the U.S.; and (4) U.S. consumers. *Id.*

With this context in mind, we turn to the particular facts of this investigation. Aspen and the IA assert that the statutory public interest factors do not weigh against the issuance of an

LEO in this investigation. Respondent Alison disagrees.[17] Alison argues that "Aspen has lost money in every year since its inception in 2001." RespReply at 18 (citing CX-904 at 17); *see also* Respondent Guangdong Alison Hi-Tech Co., Ltd.'s Submission Regarding Public Interest at 2 ("AlisonPISub"), EDIS Doc ID 627416 (Oct. 31, 2017) (citing Tr. (Gould) at 238:8-13; 239:11-13). Alison contends that "Aspen's corporate witness attempted to mask these financial woes by [] attributing Aspen's losses to a stock purchase, championing its increasing revenue, and denying any operational losses." RespReply at 18 Relying primarily on information from Aspen's public financial records, Alison asserts that Aspen has yet to achieve positive total cash flow and its ability to generate positive cash flow is uncertain. *Id.* at 18-19 (citing CX-903 at 17; CX-904 at 17). According to Alison, "[g]iven Aspen's admittedly shaky financial condition, as revealed by its own SEC filings, there are significant concerns that if Alison and Nano are eliminated as competitors, U.S. consumers could be left without a supply of aerogel products." *Id.* at 19; *see also* AlisonPISub at 2.

In response, Aspen argues that "Alison's assertion that Aspen's financial condition is 'tenuous' is belied by the fact that Aspen's revenues have continued to scale exponentially for a period of over sixteen years." AspenSub at 29 (citing CDX-1105 (showing Aspen's revenue has grown from $65,000 in 2001 to $120,532,000 in 2015)). Aspen argues that "Respondents aired this argument not through an accounting expert, but via a cross-examination of Dr. Gould that ignored crucial portions of Aspen's SEC filings—portions which revealed that Aspen is '[a]bsolutely not' selling its aerogel blankets at a loss and has had 'positive cash flows from operating activities' of millions of dollars in recent years." *Id.* at 30 (citing Tr. (Gould) at 251:1-

[17] Respondent Nano's public interest statement only asks the Commission to adopt the recommended determination that any limited exclusion order includes a certification provision. *See* Respondent Nano Tech Co., Ltd.'s Public Interest Submission, EDIS Doc ID 627418 (Oct. 31, 2017).

4, 255:14-15). Aspen asserts that the "net losses" cited by Respondents "stemmed from a stock conversion loss in connection with Aspen's IPO that must be reported to the SEC—the 'loss' had nothing to do with the patents-in-suit or Aspen's immensely successful sales of products that are covered by these patents." *Id.* (citing Tr. (Gould) at 249:5-253:17). Aspen contends that "it continues to expand its aerogel product offerings." *Id.* at 29. Aspen concedes "that some of Aspen's net losses are attributed to construction costs for new facilities," as Respondents argue, but that such "expenditures on additional manufacturing facilities only further demonstrate that Aspen's endeavors are successful and, moreover, that Aspen is willing to invest and scale its output to satisfy additional demand for composite aerogel insulation products." *Id.* at 31.

The Commission finds there is insufficient evidence to support Alison's contention that U.S. consumers could be left without a supply of aerogel products if the Commission issues a LEO in this investigation. Even though Aspen experienced net losses in 2013, 2014, and 2015 as reported in Aspen's SEC filing and confirmed by Dr. Gould, such losses by themselves do not demonstrate a likelihood that "Aspen could soon go out of business." AlisonPISub at 5. Dr. Gould is not an accounting expert and repeatedly stated at the hearing that he was not qualified to discuss the financial implications of statements made in Aspen's SEC filings. *See* Tr. (Gould) at 249:13-14, 250:12-13, 254:19-20. Moreover, Aspen has provided reasonable explanations for the net losses cited by Respondents and it is undisputed that Aspen's revenue has increased exponentially since its inception in 2001. AspenSub at 28-31; *see also* Tr. (Gould) at 250:4-17 (testifying that Aspen's earnings before income taxes, depreciation, and amortization has been positive many times), 251:1-9 (testifying that Aspen absolutely does not sell its aerogel blankets at a loss). Thus, the Commission finds that Alison's prediction that "Aspen could soon go out of business" is conjecture and not supported by the record evidence as a whole.

Other than the above-discussed argument regarding the potential effect of the proposed remedy on U.S. consumers, Respondents do not address the other statutory public interest factors.

Aspen argues that the proposed exclusion order will have no adverse effect on the public health and welfare in the U.S. because composite aerogel insulation material "is not a technology that is unique to medical products, pharmaceuticals, or other products that are important in the delivery of healthcare or the maintenance of public health or safety." AspenSub at 32. Aspen also points out that there are other non-infringing alternative insulation materials available, both aerogel and non-aerogel, and that Aspen can fulfill any additional demand for insulation materials. *Id.* Respondents do not dispute these statements. RespReply at 18-20.

Aspen asserts that the exclusion order will have no adverse effect on the production of like or directly competitive articles in the U.S. because it "manufactures and sells aerogel insulation materials in the United States that are similar to the infringing products that would be excluded." AspenSub at 28. Aspen argues that "Respondents have purportedly sold only small quantities of samples of their products to date in the United States," and "[g]iven Aspen's ability to meet demands of the United States market, it is unlikely that consumers would experience any supply-related impact if the recommended exclusion order issues." *Id.* at 31. Respondents provide no information pertaining to the production of like or directly competitive articles in the United States. RespReply at 18-20.

Finally, Aspen argues that the "exclusion order will have no adverse effects on competitive conditions in the U.S. economy, and there is no evidence suggesting that the opposite could be the case." AspenSub at 33. Aspen contends that the "record is clear that Aspen will continue to provide composite aerogel insulation material to the various segments of

the U.S. economy that purchase such materials." *Id.* Respondents provide no information to address the public interest factor of competitive conditions in the United States economy, other than referencing its certification and validity arguments. RespReply at 19-20.

Based on the parties' submissions, the Commission finds that the evidence of record as to the statutory public interest factors does not militate against the Commission's issuance of a limited exclusion order with the standard certification provision.

C. Bonding

During the 60-day period of Presidential review, imported articles otherwise subject to remedial orders are entitled to conditional entry under bond. 19 U.S.C. § 1337(j)(3). The amount of the bond is specified by the Commission and must be an amount sufficient to protect the complainant from any injury. *Id.*; 19 C.F.R. § 210.50(a)(3). Here, the parties have stipulated to a bond of 100% of the entered value of covered products. ID at 268. Thus, the Commission sets a bond of 100% of the entered value of infringing products during the period of Presidential review.

IV. CONCLUSION

For the reasons discussed above, the Commission affirms with modifications the ID's finding of a violation of section 337 by both Respondents in connection with claims 1, 7, and 9 of the '359 patent; claims 15-17, and 19 of the '123 patent; and claims 11-13, 15, 17-19, and 21 of the '890 patent; and by Respondent Nano in connection with of claims 12, 15, and 16 of the '359 patent. The Commission reverses the ID's finding of a violation of section 337 by both Respondents in connection with claim 5 of the '359 patent.

The Commission has determined to issue relief in the form of an LEO with the standard certification provision barring entry of both Respondents' composite aerogel insulation materials that infringe one or more of claims 1, 7, and 9 of the '359 patent; claims 15-17, and 19 of the

'123 patent; and claims 11-13, 15, 17-19, and 21 of the '890 patent; and barring entry of Respondent Nano's composite aerogel insulation materials that infringe one or more of claims 12, 15, and 16 of the '359 patent. The Commission has also determined to set a bond of 100% of the entered value of infringing products during the period of Presidential review.

By order of the Commission.

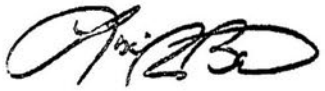
Lisa R. Barton
Secretary to the Commission

Issued: February 22, 2018

CERTAIN COMPOSITE AEROGEL INSULATION MATERIALS AND METHODS FOR MANUFACTURING THE SAME **Inv. No. 337-TA-1003**

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **OPINION** has been served by hand upon the Commission Investigative Attorney, **Yoncha Kundupoglu, Esq.,** and the following parties as indicated, on **February 22, 2018.**



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