NA 03-0003-C B/H Sud-Chemie v CSP [4]
Judge Sarah Evans Barker Signed on 8/8/06

NOT INTENDED FOR PUBLICATION IN PRINT

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF INDIANA
NEW ALBANY DIVISION

SUD-CHEMIE, INC,	)	
	)	
Plaintiff,	)	
vs.	)	NO. 4:03-cv-00003-SEB-WGH
	)	
CSP TECHNOLOGIES, INC,	)	
	)	
Defendant.	)	

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF INDIANA
INDIANAPOLIS DIVISION

SUD-CHEMIE INC., Plaintiff,	)	
vs.	)	4:03-CV-003-SEB-WGH
CSP TECHNOLOGIES, INC., Defendant and Cross-Plaintiff.	)	

ENTRY DECLARING THE DEFENDANT'S PATENTS VALID AND INFRINGED BY PLAINTIFF[1]

This matter is before the Court for decision on the issues of validity and infringement of two patents: United States Patent Number 5,911,937 ("the '937 patent") and United States Patent Number 6,214,255 ("the '255 patent") (collectively "the CSP patents" or "the patents-in-suit"),[2] which are owned by Defendant/Cross Plaintiff, CSP Technologies, Inc. ("CSP") and asserted against Plaintiff, Süd-Chemie, Inc. ("SCI"), which denies that it is infringing the patents-in-suit and further maintains the CSP patents are invalid.

The CSP patents claim both the process for creating and the resulting structures of "desiccant entrained polymers" which are designed to absorb excess moisture that is internal or external to a container. CSP contends that its patented technology is a channel morphology within the desiccant entrained polymers which allows moisture to reach desiccant (moisture

[1] This ruling also incorporates orders GRANTING Defendant's Motion to Strike Testimony (Dkt. # 595), see Factual Background Section VII, infra, and Defendant's Motion for Leave to File and consider the submissions contained therein. (Dkt. # 604).

[2] Although the trial was initially scheduled to address a third patent, United States Patent Number 6,124,006 (the "'006 patent"), the parties agreed that issues regarding the '006 patent would not be included at trial or otherwise considered in this ruling.

absorbing) particles contained in the interior of a plastic composition. CSP maintains that a product offered for sale by SCI contains the patented channel technology and thus infringes the patents-in-suit.

SCI responds, maintaining that CSP has not demonstrated that the accused product incorporates the patented channel technology and, moreover, the CSP patents are invalid because they do not enable one skilled in the art to achieve the alleged channel technology, they do not sufficiently describe claimed channel technology, and they were anticipated and/or obvious in light of United States Patent Number 5,432,214 ("the Lancesseur patent" or "Lancesseur), which is owned by SCI.

In an Order dated January 4, 2006, the Court limited the parties' evidence and arguments only to the questions of validity and infringement of patents-in-suit.[3] The trial was conducted to the Court over five (5) days, between May 15, 2006, and May 19, 2006. A post-trial briefing schedule was set for submission of the parties' findings and conclusions, trial briefs, and response briefs. The final submission was due on or before July 17, 2006 (per the Court's Order of June 15, 2006, Granting an Extension of Time to file Post-Trial Briefs, Dkt. # 594).

Having now considered the evidence adduced at trial and the parties' post-trial submissions, we hold, for the reasons set forth in detail below, that the '937 and '255 patents are valid and that SCI has infringed Claims 1, 4, 7 and 25 of the '937 patent and Claims 1 and 6 of the '255 patent.

[3] The Court also directed that questions of inequitable conduct and enforceability were not to be presented for judicial resolution at the May 15, 2006, trial. See February 6, 2006, Entry Clarifying Order on Various Motions (Dkt. # 477).

Factual Background[4]

I. The Parties

SCI, a Delaware corporation, is a specialty chemical company which develops, produces and markets compositions for industrial packaging and other applications. SCI also controls the pharmeutical activities of a French company named Airsec S.A. ("Airsec"), the manufacturer the accused product. Tr. 95.[5] CSP, an Alabama corporation, is a design and engineering company specializing in custom plastic products and systems for use in the food, drug, electronic, health care and packaging industries.

At issue here are two patents owned by CSP for the design and manufacture of a plastic vial with an internal sleeve composed of a desiccant entrained polymer. In non-industry terms, a desiccant entrained polymer is best described as a moisture-absorbing plastic structure. Desiccant entrained polymer products are used in the industrial packaging of goods which require a moisture-free environment, such as foodstuffs, pharmaceuticals, medical diagnostics (such as diabetic blood testing strips) and consumer products.

The two CSP patents at issue in this infringement and validity trial are: United States Patent Number 5,911,937 ("the '937 patent") and United States Patent Number 6,214,255 ("the '255 patent") (collectively "the CSP patents" or "the patents-in-suit").

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[4] Through this Entry the following chemical and experimental abbreviations are frequently used: ethylene vinyl acetate ("EVA"), ethylene-vinyl alcohol ("EVOH"), polyvinyl alcohol ("PVOH"), moisture vapor transmission rate ("MVTR"), scanning electron microscopy ("SEM"), atomic force microscopy ("AFM"), transmission electron microscopy ("TEM"), differential scanning calorimetry ("DSC").

[5] SCI is a subsidiary of a German company, Sud-Chemie AG. Docket No. 223 at 1. Sud-Chemie AG also owns a French Company, Airsec S.A., which manufactured the accused HDI Product. Id; see also Tr. 510:2-4. SCI, Sud-Chemie AG, and Airsec S.A. will collectively be referred to herein as SCI.

II. The Patents in Suit.

A. The '937 Patent

The '937 patent, entitled "Desiccant Entrained Polymer," was filed on March 5, 1996 as application number 08/611,298 ("the '298 application") and issued on June 15, 1999. D1; Docket No. 577, JSF No. 1. The '937 patent is the "child" of a parent patent application, U.S. Pat. App. 08/424,996 ("the '996 application"), now abandoned. The '937 patent is directed to both the "process" for modifying a plastic material (polymer) so that it is capable of absorbing moisture through solidified interior pathways containing a desiccating (that is, moisture absorbing) agent and to the resulting structures. The U.S. Patent and Trademark Office ("USPTO") considered over 100 prior art references in connection with the prosecution of the '937 patent. Joint Stipulated Fact No. 13.

The "desiccant entrained polymer," from which plastic liners, disks and wrapping sheets are made, consists of a rigid, molded plastic (the polymer) that contains a moisture-absorbing agent (the desiccant), the purpose of which is to absorb any excess moisture internal or external to the container. There are three components to the invention: (1) a polymer base matrix, (2) a desiccant; and (3) a channeling agent. '937 patent, col.6, ll. 25-35' col. 9.

The establishment of channels throughout a desiccant entrained polymer represents the innovation over the prior art. The solidified channels act as conduits for transporting moisture from outside the plastic to inside, where the desiccant is entrained. '937 patent, col. 5, ll. 23-30 (the channel technology is also referred to as "the patented technology" or the "Hekal Technology").

At issue in this trial are Claims 1, 4, 7, and 25 of the '937 patent, which CSP asserts against SCI and which SCI claims are invalid. Claim 1 of the '937 patent is an independent

claim that provides as follows, with the court's claim construction of disputed terms bracketed and underlined:

> A process for producing a moisture absorbing desiccant entrained polymer, said process comprising:
>
> causing a polymer to assume a molten state, said polymer acting as a moisture barrier in a solidified state;
>
> blending a desiccating agent into the polymer so that the desiccating agent is distributed within the polymer;
>
> blending a channeling agent [a hydrophilic material (having a greater moisture transmission rate than the polymer based material) that is melted and forms passages throughout a polymer base] into the polymer so that the channeling agent is distributed within the polymer thereby creating a blended mixture; and
>
> solidifying the mixture so that the channeling agent forms passages [solid pathways that extend throughout the polymer base from the exterior surface of the plastic structure into its interior] in the mixture through which moisture is communicable to desiccating agent entrained within the mixture.

Claim 4 of the '937 patent is a dependent claim of Claim 1 that provides as follows:

> The process of claim 1 wherein the polymer is a moisture barrier that more greatly resists diffusion of moisture there across than does the desiccating agent or the channeling agent.

Claim 7 of the '937 patent is a dependent claim of Claim 1 that provides as follows:

> The process of claim 1 wherein the desiccating agent has a greater attraction for the channeling agent than for the polymer thereby causing a greater concentration of desiccating agent to form in the channeling agent than in the polymer.

Claim 25 of the '937 patent is an independent claim that provides as follows:

> A process for providing a moisture absorbing insert for a container, said process comprising:
>
> blending a desiccating agent and a channeling agent [a hydrophilic material (having a greater moisture transmission rate than the polymer

based material) that is melted and forms passages throughout a polymer base] into a polymer thereby forming a mixture, said polymer acting as a moisture barrier in a solidified state; and

solidifying the mixture so that the channeling agent forms passages [solid pathways that extend throughout the polymer base from the exterior surface of the plastic structure into its interior] in the mixture through which moisture is communicable to the desiccating agent entrained within the mixture.

B. The '255 Patent.

The '255 patent, also entitled "Desiccant Entrained Polymer," was filed on July 27, 1998 as application number 09/122,912 ("the '912 application") and issued on April 10, 2001. D3; Docket No. 577, JSF No. 2. The '255 patent is directed to a "composition" having "veined domains of channeling agents." The applications for the '937 and '255 patents were co-pending. D1; D3; D4; Tr. 272-73. The Utility Patent Application Transmittal claimed the '912 application was a continuation of the '298 application. D4.024. However, under the heading "RELATED APPLICATIONS," the '912 application merely states: "This application is a continuation-in-part of U.S. patent application entitled DESICCANT MATERIAL INCLUDED IN A CLOSED CONTAINER having Ser. No. 08/424,996 filed on Apr. 19, 1995, now abandoned." D4.027.

The USPTO considered over 85 prior art references in connection with the prosecution of the '255 patent. Joint Stipulated Fact No. 12.

At issue in this trial were Claims 1 and 6 of the '255 patent, which CSP asserts against SCI. Claim 1 of the '255 patent is an independent claim that provides as follows, with the court's claim construction of disputed terms bracketed and underlined:

The composition having veined domains of channeling agents comprising at least three components:

(a) wherein component A is a polyolefin;

(b) wherein component B is a channeling agent [a hydrophilic material (having a greater moisture transmission rate than the polymer based material) that is melted and forms passages throughout a polymer base] consisting of a hydrophilic material that is heated above its melt point during processing of the composition;

(c) wherein component B is substantially separate from component A and forms channels [solid pathways that extend throughout the polymer base from the exterior surface of the plastic structure into its interior];

(d) wherein component C is a desiccating agent;

(e) wherein the volume fraction of component A represents at least about 50% by volume of the total volume of components A, B and C;

(f) wherein the preferential affinity between component B and component C is greater than between components A, and component C;

(g) wherein at least two aggregates are formed, one aggregate is composed of a majority of components A, and the second aggregate is composed of a majority of component B and a majority of component C; and

(h) wherein component B forms channels for moisture transmission through the polymer.

Claim 6 of the '255 patent is a dependent claim of Claim 1 that provides as follows:

> The composition of claim 1, wherein the range of desiccating agent is between about 40% to about 60% by weight of the total composition.

CSP Technologies, Inc. ("CSP") is the owner of both the '937 and '255 patents and Ihab M. Hekal ("Dr. Hekal") is the listed inventor for both the '937 and '255 patents. Docket No. 577, JSF No. 3. Dr. Hekal is a Ph.D. packaging scientist who was recommended to and then specifically sought out by CSP to research and develop the patented technology. Tr. 19-21.

III. The Products At Issue

The products at issue are containers that include desiccant entrained polymers for packaging medical test strips. The desiccant is a absorptive material added to the packaging to soak up moisture released by the contents of the container. Prior to the inventions

of the patents-in-suit, loose desiccant typically was located in the cap or in a sachet (pillow) included within the container. Tr. 28:10-16.

A. CSP's Development Efforts and Products.

The technology for the CSP patents was originally developed as containers for mini M&Ms™ which could absorb the moisture the candy released. In designing the M&M™ containers, CSP sought to develop a product that included the desiccant within the plastic packaging which would still quickly remove moisture from inside a plastic container. Tr. 18:2-18. The M&M™ project was started by CSP in 1995. Tr. 21:18-20. CSP later developed a new container for medical test strips that also included the desiccant embedded inside the wall of the plastic container. Tr. 20-27.

The president and CEO of CSP, Robert Abrams ("Mr. Abrams"), testified that there had been a long felt need in the industry for a package that included the desiccant within the walls of the package which could still remove moisture quickly. Tr. 22:3-24:8. Mr. Abrams described how several of CSP suppliers, including Exxon, Shell, and Phillips Petroleum, informed CSP that creating desiccant entrained polymers which quickly absorb moisture was likely impossible. Tr. 18.

CSP initially made sample containers incorporating the patented technology during the third or fourth quarter of 1995 and provided sample containers to LifeScan, a blood sugar diagnostic strip manufacturer, around January 1996. Tr. 42:23, Tr. 45:18-46:6-11. Although it had not yet finalized a commercial production process, in October 1996, CSP offered to sell to LifeScan containers incorporating the patented technology. Tr 48-49.

In addition to the patented technology, CSP also developed an "air tight leakproof attached cap vial," otherwise known as a "flip-top cap" which allows the attached container lid

to be opened and closed with one hand. Tr. 27-29. CSP's promotional materials note that the flip-top cap is particularly advantageous for use by elderly persons and those with compromised dexterity. Tr. 49:16-52:9.

CSP has a total of approximately 35 products that it is selling or bringing to the market that incorporate the patented technology. Tr. 26:12-17. CSP produces approximately 400 million pieces a year that utilize the patented channel technology. Tr. 26:21-27:2. CSP sells significant amounts of its patented product to several companies, including the pharmaceutical giants, Johnson and Johnson, Abbott Laboratories, Bayer, Hoffman Roche and Beckton Dickinson. Tr. 25:3-26:2. Mr. Abrams testified that CSP supplied all of the new products for the four main manufacturers of diagnostic test strips (Abbott Laboratories, Roche Diagnostics, Bayer, and Johnson & Johnson). Tr. 29-30. In addition, Mr. Abrams testified that as a result of the Hekal technology and the flip-top cap, CSP has been able to sell its containers at a premium of approximately 30% over the rest of the industry.

CSP's channel technology received an award from the U.S. Patent and Trademark Office in recognition of its being new and exciting. Tr. 30:4-20. CSP's invention also has generated praise from experts in the field. Tr. 227.

B. SCI's Development Efforts and Products.

In 1996, SCI was making plans to market tubes and stoppers in the United States. Tr. 633:14-634:4; D125:001-002. A tube and stopper is a plastic vial with a push-on cap that contains loose desiccant. Tr. 640:7-23. At the time, SCI believed there was great potential for selling tubes and stoppers in the U.S. market, particularly in the diagnostic strip market, due to soaring growth in the diagnostic industry. Tr. 651:16-22. SCI believed that tube and stopper sales would become an important part of the company's overall business, both in the United

States and abroad. Tr. 653:1-7.

SCI was the owner of United States Patent Number 5,432,214, issued on July 11, 1995, which was invented by Airsec CEO Didier Lancesseur ("the Lancesseur patent" or "Lancesseur). The Lancesseur patent describes a dehydrating (moisture absorbing) plastic composition containing a polymer, a second polymer (described as an elastomer), a desiccant, and fibers. D177. In an internal SCI memorandum dated March 9, 1998, Jean-Pierre Giraud stated (as translated from French to English for the Court): "AIRSEC use [sic] organic fibers (synthetic, animal or vegetable) to draw moisture from the outside to the inside of the material." DTX 17; See also PTX 330 at 3. In a 2005 patent application, SCI stated that the "fibers of Lancesseur were designed to 'wick' moisture that was present outside of the plastic material to the inside of the plastic material where the absorbent material was located." D404.078. SCI referred to compositions made pursuant to Lancesseur as 2AP. D131.007 ("2AP is a patented material designed by Airsec. The material primarily consists of polystyrene, a desiccant material, and fibers.").

Ultimately, SCI discovered that the Lancesseur technology was not workable because the fibers burned up during processing and fibers in any event were not permitted by the FDA. Tr. 142:7-13; Tr. 142:24-143:2, 192:14-16; D473.010; D442; Tr. 615:10-15; D121.011 (explaining that Lancesseur has "limited utility" because fibers burn during processing and are not FDA approved). As of late 2004, SCI had neither offered for sale nor sold a fiber-based desiccant entrained polymer composition in the United States. Joint Stipulated Fact No. 21. SCI's head of research and development for the Americas Region, Stefan Dick ("Dr. Dick"), suggested in an in-house presentation that SCI might consider abandoning the Lancesseur patent rather than continuing to pay to maintain the patent. D473.010; Tr. 615:19-24; Tr. 616:4-9. 172.

C. SCI's Concern about and Focus on CSP's Patented Technology.

As SCI explored the market for tubes and stoppers, it discovered that CSP was marketing a competing vial that used the patented technology that utilized flip-top cap and that SCI's customers had become interested in the CSP vial. D126.001-002; Tr. 654:10-24; Tr. 656:2-658:22. Robert Crossno ("Mr. Crossno"), an SCI sales and marketing director, testified that as he was making sales calls for SCI, he consistently heard from his customers about CSP's vial. Tr. 638:5-7. By 1998, SCI's internal communications, recognized that CSP's desiccant-entrained polymer vial was "an innovative product" and that CSP was starting to aggressively market it. Tr. 663:2-21; D131.018.

SCI obtained one of CSP's sample vials as early as 1995-1996. Tr. 92:12-22. SCI also obtained samples of CSP's products at trade shows and pharmacies. Langer Dep. 341:20-342:9 (Oct. 28, 2004); Lancesseur Dep. 52 :10-16 (Oct. 28, 2004). In March 1998, SCI began studying CSP's channel technology after obtaining a published patent application pertaining to the Hekal technology that CSP had filed in Europe. D17.003.[6] SCI began monitoring CSP's patents no later than the fourth quarter of 1999.

Docket No. 577, Joint Stipulated Fact No. 16. SCI personnel also were engaged in discussions regarding CSP's channeling agent patents for the purposes of benchmarking (i.e., "to see whether there are… new technologies, new products going around and catch an opportunity to improve your products"). Judek Dep. 34:4-35:2 (Dec. 21, 2004).

Based on tests conducted on reproduced samples of the Hekal technology, Mr. Giraud

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[6] Because the European patent included different disclosures and covered somewhat distinguishable technology than the patents in suit, we decline to engage in further comparison of these patents.

recorded in an internal memo dated March 5, 1998, that the CSP containers:

> while absorbing humidity remarkably well and quickly, have an aspect similar to saturation, so that they **will never compete with AIRSEC products, which retain an absolutely dry surface whether the piece is saturated or not.**

PTX 330-T at 3 (emphasis in original). Mr. Giraud testified that as of Fall, 1999, SCI was not actively involved in the research and development of desiccant entrained polymer systems. Tr. 90:7-9. 166.

However, by a few months later, in February of 2000, SCI had come to regard CSP as one of the biggest threats to the continued success of its tube and stopper products, concluding that it had to begin marketing products with desiccant entrained polymers. Tr. 664:2-3; Tr. 665:21-666:12; D137:012-013. An SCI internal sales call report, dated September 3, 2000, indicates that many diagnostic customers were preferring CSP's containers because the desiccant-entrained polymer eliminated the need for placing desiccant within the packaging space. D134:002; Tr. 667:10-668:19. SCI was concerned that CSP would make "strong inroads into the diagnostic market" with its desiccant-entrained polymer vial. Tr. 668:20-25; D134:002-003.[7]

D. The "HDI Product."

In June 2001, SCI was informed that its customer, Home Diagnostics, Inc. ("HDI"), was switching from SCI's tubes and stoppers to CSP's patented vial. Tr. 671:11-15. HDI apparently

[7] Mr. Crossno testified that the primary feature preferred by customers in the CSP product was the flip-top cap and that at no time did he perceive the Hekal technology to be something that SCI needed to copy since SCI already had the 2AP material. See Tr. 635:4-638:13, Tr. 642:9-13, 647:11-23, 685:10-17, 685:18-686:3. Mr. Crossno's testimony on these matters, however, was substantially impeached by contemporaneous documents indicating to the contrary which he himself had prepared. See, e.g., D134:002-003, D137:012-013

had come to believe that CSP's vial was the "new generation in diagnostic packaging" and that CSP's vial would give HDI an advantage in the market. D136.001; D139.001.

In response to the apparent loss of the HDI business, Mr. Crossno wrote an internal SCI email to his supervisor, dated July 15, 2001, which stated the following:

> We will continue to fight, but I think the reality is, the Capital Specialties type tube with 2AP type material inside with a hinge cap will take over as the primary packaging for glucose strips, and all other test strips. At least in the U.S. and possibly the world until a better packaging is introduced like a dispensing unit.

D139; Tr. 675:8-19.6. In a July 26, 2001, internal email, Mr. Crossno reiterated his previous prediction and stated:

> I am convinced that the U.S. market will eventually convert all tube and stoppers to the CP type 2AP tube with hinge cap. If we want to stay in the business, we will need to offer the same tube, or take the technology to a new level, like a dispensing unit.

D326; Tr. 678:1-14; see also Tr. 682:16-20. SCI also began to realize that CSP's tube with desiccant entrained polymer with a flip-top cap was going to take over the industry (D139-001; Tr. 675:8-19), concluding that it had to copy CSP's technology in order to compete. D326.001. ("[W]e will need to offer the same tube"); Tr. 678:1-14; see also Tr. 682:16-20.

On or about July 2001, SCI offered for sale to HDI in the United States a tube containing a desiccant entrained polymer composition (hereinafter referred to as the "HDI Product"). It is undisputed that the HDI Product contains 42% polyethylene, 8% ethylene vinyl acetate ("EVA"), and 50% molecular sieve. Docket No. 577, Joint Stipulated Fact No. 5; Tr. 158:24-159:2. It is also undisputed that the HDI Product was produced by a process that included the following steps: (a) blending EVA into a polymer so that the EVA was distributed within the polymer thereby creating a polymer blend; and (b) blending Molecular Sieve into a polymer blend so that the Molecular Sieve was distributed within the polymer blend. Joint

Stipulated Facts Nos. 8, 9.

E. SCI Believed It Was Infringing the CSP Patents.

By at least March 2000, SCI began its own investigation regarding its infringement of the asserted patents, which investigation continued through the start of this litigation. Joint Stipulated Fact No. 17; D429.039; Tr. 541:13-22. By June 2000, SCI realized it had infringement "problems" related to CSP. Tr. 614:22-25; D473.013 (presentation stating "2AP - suggestions: solve problems concerning patent situation"); Rousseau Dep. 179:21-180:3 (Dec. 1, 2004) ("2AP - suggestions: solve problems concerning patent situation" refers to CSP's patents).[8]

An August 30, 2001 internal SCI email from SCI's Global Business Unit Manager ,Klaus Langer ("Mr. Langer"), stated: "[A]t present my conclusions and concerns are in particular that the present new 2AP tube design for Inverness might infringe the relevant CS-patent, which already has been granted for the USA." D438.001; Tr. 597:14-598:5. Mr. Langer's statement was written in response to a memo drafted by SCI's Dr. Dick, which memo refers to the one CSP patent that had been granted at that time, to wit, the asserted '937 patent. D438.002. The 2AP tube design for Inverness was identical to the HDI Product, with the exception of the dimensions of the tube. Tr. 597:1-13; D429.064.

Another internal memo prepared by Dr. Dick, dated October 5, 2001, revealed that SCI's "primary goal is to avoid litigation," which SCI could "only achieve . . . if we make the case as unattractive for CSP as possible." D444.002; Tr. 606:2-5. Dr. Dick's memo outlined three

[8] Dr. Dick's testimony to the contrary has been rejected in toto by the Court especially on matters relating to infringement because his testimony was completely impeached by contemporaneous documents he had prepared.

possible ways for SCI to achieve its goal:

The first option was "to work according to the prior art," which SCI hoped to accomplish by locating a prior art patent and working according to its teachings. D444.002; Tr. 606:14-15. The memorandum indicates that SCI's attorney, Russell Sandidge ("Mr. Sandidge"), believed the problem with SCI's 2AP product was that the composition contained EVA, but if SCI could make its product without EVA it "would solve our problems." D444.002. Mr. Sandidge also recommended trying to formulate the 2AP product according to one of the examples disclosed in the Lancesseur patent. D444.002.

The second option was to prove that its accused product "does not contain channels in the sense of the CSP patents." D444.002. To that end, SCI's attorney recommended finding "an experimental method to prove this in a way that CSP would have a hard time to argue against." D444.002. Dr. Dick explained that the goal of pursuing this option "would be again to have such good arguments in hand that CSP realizes that

suing us is worthless." D444.002.

The third option was to invalidate CSP's patents. D444.003; Tr. 610:2-7. With respect to this final option, Dr. Dick stated:

> This option is the most difficult because we would have to prove invalidity of the CSP patents in the case of a litigation. According to Russell [Sandidge] this would be an uphill battle for us, because it is a matter of fact that the CSP patents were granted by the USPO [i.e., USPTO] over tons of prior art.

D444.003; see also Tr. 610:14-24.

IV. Evidence of Infringement of the CSP Patents by the HDI Product.

A. Infringement Factual Summary.

In order to prove infringement, CSP must prove that the HDI Product contains each of

the limitations contained in the asserted claims of the '937 and '255 Patents. See K-2 Corp. v. Salomon S.A., 191 F.3d 1356, 1362 (Fed. Cir. 1999).

Drawing on the numerous tests he performed, as well as his education and experience, CSP's technical expert, Dr. Chris Macsoko ("Dr. Macosko"), opined that the HDI Product infringes claims 1, 4, 7 and 25 of the '937 patent and claims 1 and 6 of the '255 patent. Tr. 343:9-501:7. Dr. Macsoko performed the following tests on both the HDI Product and on formulations reproducing the HDI Product: scanning electron microscopy ("SEM"), atomic force microscopy ("AFM"), energy dispersive x-ray spectroscopy ("EDS"), infrared ("IR"), moisture uptake (two different sets),[9] moisture vapor transmission rate ("MVTR"), hydrolysis and differential scanning calorimetry ("DSC"). D515b; Tr. 343:9-501:7. Dr. Macosko further testified that the HDI Product incorporates a hydrophilic channeling agent and channels, as defined by the Court in our Entry on Claim Construction. Tr. 382:17-383:5.

SCI's technical expert, Dr. Donald Paul ("Dr. Paul"), based on his education and experience and the test results he reviewed (though he testified that he had conducted none himself), opined that the HDI Product does not infringe any of the claims in either CSP Patent.

[9] We do not include in our analysis the moisture uptake tests performed by Dr. Macosko. During his testimony Dr. Macosko could not explain the reason(s) that the 8% EVA sample had a lower capacity than the 4% EVA and 0% EVA samples, stating that he believed there was something wrong with the 8% EVA sample and he could not trust the data. See Tr. 458-61, 496. Based on the trial testimony, adding EVA to a sample of molecular sieve and polyethylene should increase the sample's capacity. Thus, like Dr. Macosko, we are at a loss to understand the basis for the reduced capacity of the 8% EVA sample. On the other hand, Dr. Paul concluded, without explanation and curiously, by our assessment, that adding 4% EVA increased the sample's capacity while adding 8% "noticeably" decreased the capacity of the sample. Tr. 762-63. Without some scientific explanation to explain his wholly unexpected and counter-intuitive conclusion, we are not inclined to accept Dr. Paul's testimony on this matter. As a result, we believe the most reasonable explanation for the data in Dr. Macosko's moisture uptake test is that the 8% EVA sample is not reliable.

Dr. Paul believes that the tests that Dr. Macosko relied on to prove infringement lack the microscopic resolution to discern whether the HDI Product actually has channels. Tr. 699:23-700:5. Dr. Paul also believes that pores, and not channels, may account for the increased moisture transmission properties of the HDI Product.

In the ensuing section of this opinion, because it is undisputed that the HDI Product incorporates many of the claim limitations in the CSP Patents, we have organized our discussion of the relevant facts about the HDI Product into categories based on the claim limitations in the CSP Patents. Our discussion of the facts relevant to the disputed aspects of the HDI Product (whether it forms channels and whether EVA is a channeling agent) is undertaken at the end of that section.

B. Factual Findings Regarding Infringement of Claim 1 of the '937 Patent.

1. A Process for Producing a Moisture Absorbing Desiccant Entrained Polymer, Said Process Comprising:

It is undisputed that the HDI Product is a moisture absorbing desiccant entrained polymer. Tr. 378:8-13.

2. Causing a Polymer to Assume a Molten State, Said Polymer Acting as a Moisture Barrier in a Solidified State;

It is undisputed that the polyethylenes in the HDI Product are polymers. Joint Stipulated Fact No. 6. It is undisputed that the HDI Product was made by a process whereby the polyethylene polymer was melted and assumed a molten state. Tr. 169:25-170:3; Tr. 378:16-17. It is also undisputed that the polyethylene in the HDI Product provides a moisture barrier. Tr. 162:18-20; 379:22-24.

3. Blending a Desiccating Agent into the Polymer So That the Desiccating Agent Is Distributed Within the Polymer;

It is undisputed that the Molecular Sieve in the HDI Product is a desiccating agent. Joint Stipulated Fact No. 7. It is also undisputed that the HDI Product was produced by a process that included the following step: "blending molecular sieve into a polymer blend so that the molecular sieve is distributed within the polymer blend." Joint Stipulation of Fact No. 8. The molecular sieve desiccating agent is blended and distributed within the polyethylene polymer in the HDI Product. Tr. 358:8-359:17; Tr. 378:19-379:5; D192; D190; D74; D75; D76.

4. Blending a Channeling Agent into the Polymer So That the Channeling Agent Is Distributed Within the Polymer Thereby Creating a Blended Mixture; and

It is undisputed that the HDI Product was produced by a process that included the following step: "blending EVA into a polymer so that the EVA is distributed within the polymer thereby creating a polymer blend." Joint Stipulated Fact No. 9. The EVA and molecular sieve desiccating agent in the HDI Product were blended into and distributed within the polyethylene polymer. Tr. 169:25-170:3; Tr. 177:10-25; Tr. 379:7-11; D479; D191.

SCI disputes whether the EVA in the HDI Product functions as a channeling agent. We discuss this dispute in Factual Background Section IV(I), infra.[10]

5. Solidifying the Mixture So That the Channeling Agent Forms Passages in the Mixture Through Which Moisture Is Communicable to Desiccating Agent Entrained Within the Mixture.

As noted above, SCI disputes that the EVA in the HDI Product serves as a channeling agent as well as whether channels, as defined by the Court, form within the HDI Product. The facts regarding these disputes are discussed in Factual Background Sections IV(H) & (I), infra.

[10] SCI also belatedly argued for the first time in its Post-Trial Briefs that Claim 1 of the '937 Patent requires the blending steps be performed in a particular order. Because this challenge was untimely, it has not been considered by the Court. See Legal Analysis Section II(C)(4), infra.

C. Factual Findings Regarding Infringement of Claim 4 of the '937 Patent.

1. The Process of Claim 1 Wherein the Polymer Is a Moisture Barrier That More Greatly Resists Diffusion of Moisture There Across Than Does the Desiccating Agent or the Channeling Agent.

It is undisputed that the polyethylene in the HDI Product is a moisture barrier that more greatly resists the diffusion of moisture than the EVA or the molecular sieve desiccating agent. Tr. 162:18-20; Tr. 380:2-11; Tr. 890:6-10; Joint Stipulated Facts Nos. 10, 11.

As noted above, SCI disputes whether the EVA in the HDI Product functions as a channeling agent, which dispute we discuss in Factual Background Section IV(I), infra.

D. Factual Findings Regarding Infringement of Claim 7 of the '937 Patent.

1. The Process of Claim 1 Wherein the Desiccating Agent Has a Greater Attraction for the Channeling Agent Than for the Polymer Thereby Causing a Greater Concentration of Desiccating Agent to Form in the Channeling Agent Than in the Polymer.

It is undisputed that in the HDI Product: the EVA is more polar than the polyethylene, the EVA has a greater attraction for the molecular sieve desiccant than the polyethylene, and a majority of the molecular sieve would reside in the EVA. CSP's expert, Dr. Macosko, opined that, in the HDI Product, the EVA should be more attracted to the molecular sieve and that a greater concentration of the molecular sieve desiccating agent would reside in the EVA than in the polyethylene polymer. Tr. 380:12-381:7. Although SCI disputes whether a majority of the molecular sieve resides in the EVA, the testimony from SCI's own witnesses supports Dr. Macosko's conclusions. SCI's chemical engineer, Francois Dessus ("Mr. Dessus"), testified that EVA has a higher permeability to water than polyethylene, has a higher MVTR than polyethylene, is more polar than polyethylene, and has a greater attraction to molecular sieve than polyethylene. Tr. 162-63. SCI's technical expert, Dr. Paul, conceded that in the HDI

product it is more likely that molecular sieve desiccant will reside in the EVA than in the polyethylene (although Dr. Paul admitted this only "after a lot of qualifications"). Tr. 909:17-22.

E. Factual Findings Regarding Infringement of Claim 25 of the '937 Patent.

1. A Process for Providing a Moisture Absorbing Insert for a Container, Said Process Comprising:

It is undisputed that the accused HDI Product is a container with a moisture absorbing insert. Tr. 381:10-13.

2. Blending a Desiccating Agent and a Channeling Agent into a Polymer Thereby Forming a Mixture, Said Polymer Acting as a Moisture Barrier in a Solidified State; and

It is undisputed that, in the HDI Product, the molecular sieve desiccant and EVA are blended into the polyethylene polymer forming a mixture where the polyethylene polymer acts as a moisture barrier in a solidified state. See Factual Background Section IV(B) & (C), supra; Tr. 381:20-382:1.

As noted above, the facts regarding whether the EVA in the HDI Product functions as a channeling agent are discussed in Factual Background Section IV(I), infra.

3. Solidifying the Mixture So That the Channeling Agent Forms Passages in the Mixture Through Which Moisture Is Communicable to the Desiccating Agent Entrained Within the Mixture.

As noted above, SCI disputes whether the EVA in the HDI Product acts as a channeling agent as well as whether passages (or channels), as defined by the Court, form within the HDI Product. These disputes are discussed in Factual Background Sections IV(H) & (I), infra.

F. Factual Findings Regarding Infringement of Claim 1 of the '255 Patent.

1. The Composition Having Veined Domains of Channeling Agents Comprising at Least Three Components:

It is undisputed that the HDI Product includes a composition with three components: polyethylene, EVA, and molecular sieve. Joint Stipulated Fact No. 5; Tr. 158:24-159:2; Tr. 394:16-22..

As noted previously, SCI disputes whether the EVA in the HDI Product functions as a channeling agent, which dispute is discussed in Factual Background Section IV(I), infra.

2. Wherein Component A Is a Polyolefin;

It is undisputed the polyethylene in the HDI Product is a polyolefin. Joint Stipulated Fact No. 6; Tr. 394:16-24.

3. Wherein Component B Is a Channeling Agent Consisting of a Hydrophilic Material That Is Heated Above Its Melt Point During Processing of the Composition;

It is undisputed that the EVA in the HDI Product was heated above its melt point during processing. Tr. 169:25-170:3, 394:24-395:3. It is also undisputed that, in the HDI Product, EVA is hydrophillic as defined by this court. In our March 14, 2005, Entry on Claim Construction we defined hydrophillic, as used in the CSP Patents, as "having a greater moisture transmission rate than the polymer base material." Entry on Claim Construction at 25. The parties stipulated that the EVA in the HDI Product has a greater moisture transmission rate than the polyethylene. Joint Stipulated Facts Nos. 10, 11. SCI's witnesses agree that, in the HDI Product, EVA is hydrophillic as defined by the Court. SCI's technical expert, Dr. Paul, explicitly testified that EVA is more hydrophillic than polyethylene. Tr. 741:18-19. Similarly, SCI's chemical engineer, Mr. Dessus, noted that EVA is more hydrophillic and has a higher moisture transmission rate than polyethylene. Tr. 162:14-17; 165:3-8; 166:3-11; 189:18-21.[11]

[11] We note the uniformity of opinion on this matter because SCI introduced evidence at trial suggesting that a person skilled in the art might consider EVA to be hydrophobic (water

SCI disputes whether the EVA in the HDI Product functions as a channeling agent, which we discuss in Factual Background Section IV(I), infra.

4. Wherein Component B Is Substantially Separate from Component A and Forms Channels;

Dr. Macosko's DSC analysis demonstrated that the EVA in the HDI Product formulation is in a separate phase and is not miscible (mixed) with the polyethylene. D195; Tr. 375:9-376:7; Tr. 395:4-23. Dr. Paul agreed that EVA and polyethylene are immiscible and would exist in separate phases. Tr. 909:23-910:7.

SCI disputes whether channels form in the HDI Product which we discuss in Factual Background Section IV(H), infra.

5. Wherein Component C Is a Desiccating Agent;

It is undisputed that the molecular sieve in the HDI Product is a desiccating agent. Joint Stipulated Fact No. 7; Tr. 395:24-25.

6. Wherein the Volume Fraction of Component A Represents at Least About 50% by Volume of the Total Volume of Components A, B And C;

The parties dispute whether the HDI Product includes "at least about 50%" by volume of polyethylene. It is undisputed that the HDI Product includes 42% by weight of polyethylene but, to compare the HDI Product to the claim limitation, it is necessary to convert a volume percent to a weight percent.[12] In order to convert a weight percent to a volume percent, one needs to

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hating) based on definitions other than the one provided by the Court. See Tr. 741-743.

[12] Several calculations of this type were performed during the trial by Dr. Fredrickson, Dr. Macosko, and Dr. Paul. See, .e.g, Tr. 263, 295, 419; 906-07; see also Hekal Dep. 190-196.27.

know the density of all the component parts. Dr. Paul used the manufacturer's density information, which had been obtained for him by SCI's attorneys, to convert the 42% by weight of polyethylene into a volume percent of 45.6% of the HDI Product. Tr. 906-907. When asked at trial whether 45.6% was about 50% in the context of the CSP patents, Dr. Paul was unable to answer the question. Tr. 907-909. Dr. Macosko, however, testified that in the context of the CSP patents 46% is at least about 50%. Dr. Macosko also converted the weight percent to a volume percent for the polyethylene in the HDI Product. Normally, Dr. Macosko said, he would rely on the manufacturer's density information when converting from weight percent to volume percent, as did Dr. Paul, but Dr. Macosko did not have the manufacturer's density information for the molecular sieve. Tr. 477:16-478:5. Instead, Dr. Macosko used density information calculated by CSP based on samples made by CSP of the HDI Product. Tr. 430:12-431:2. Using this density information, Dr. Macosko calculated that the HDI Product includes 50.237% by volume polyethylene can concluded that the amount was "at least about 50%." D534; Tr. 396

7. Wherein the Preferential Affinity Between Component B and Component C Is Greater Than Between Components A and Component C;

As noted above, it is undisputed that the molecular sieve has a greater attraction to the EVA than the polyethylene in the HDI product. See Factual Background Section IV(D), surpa.[13]

8. Wherein at Least Two Aggregates Are Formed, One Aggregate Is Composed of a Majority of Components A, and the Second Aggregate Is Composed of a Majority of Component B and a Majority of

[13] At trial, SCI's technical expert, Dr. Paul, was explicitly asked on direct examination whether there is a preferential affinity between the molecular sieve and EVA, which question Dr. Paul did not directly answer. Tr. 737:23-740:6. Dr. Paul did imply, however, that there exists a preferential affinity between EVA and molecular sieve in the HDI Product. Tr. 740:2-6 (noting "the surface energy between EVA and molecular sieve might be lower than that between molecular sieve and polyethylene").

Component C; and

It is undisputed that the EVA and polyethylene components of the HDI Product form two aggregates. See Factual Background Section IV(F)(4), supra. CSP's Expert, Dr. Macosko, testified that he believes that in the HDI Product a majority of the molecular sieve desiccant would reside within the EVA aggregate. Tr. 398:21-399:6. SCI's expert, Dr. Paul, agreed that, in the HDI product, it is more likely that the molecular sieve desiccant would reside in the EVA than in the polyethylene (although again Dr. Paul admitted this only "after a lot of qualifications"). Tr. 909.

9. Wherein Component B Forms Channels for Moisture Transmission Through the Polymer.

The parties vigorous dispute whether channels form in the HDI Product, which we discuss in Factual Background Section IV(H), infra.

G. Facts Regarding Infringement of Claim 6 of the '255 Patent.

1. The Composition of Claim 1, Wherein the Range of Desiccating Agent Is Between About 40% to About 60% By Weight of the Total Composition.

It is undisputed that the molecular sieve desiccant is 50% by weight of the total composition of the HDI Product. Joint Stipulation of Fact 5.

H. Evidence Regarding Channel Formation in the HDI Product.

The parties primary factual dispute regarding infringement is whether the HDI Product forms channels as defined by the Court. In our March 14, 2005, Entry on Claim Construction, we define "passages, "channels," "channel morphology," "veined domains of channeling agent," "channels for moisture transmission through the polymer" as "solid pathways that extend throughout the polymer base from the exterior surface of the plastic structure into its interior."

Entry on Claim Construction at 25.

1. Summary of Channel Dispute.

CSP's experts testified that they believe channels were formed in the HDI Product. Dr. Macosko testified that all of the testing he performed on the HDI Product formulation disclosed that the HDI Product transmits moisture through channels. Tr. 377:24-378:1. Based on his prior testing of compositions with channels, as well as his education and experience, Dr. Fredrickson ("Dr. Fredrickson"), CSP's second technical expert, opined that the HDI Product, consisting as a composition with 42% polyethylene, 8% EVA, and 50% molecular sieve, would form channels. Tr. 309:24-310:2.

SCI asserts CSP's evidence does not demonstrate channel formation. SCI's technical expert, Dr. Paul, opined that CSP's evidence of infringement "lack[ed] the resolution to discern the morphology." Tr. 700:3-5. SCI's own evidence is somewhat limited, however, since Dr. Paul never actually made any attempt to determine if the HDI Product had channels, nor could Dr. Paul directly rule out the presence of a channel morphology in the HDI Product.. Tr. 863:2-20, 928:11-15.

We next turn to an examination of facts regarding the various tests performed on the HDI Product by Dr. Macosko, which tests provide the underpinnings of the parties' channel formation dispute.

2. Channel Formation Tests Performed by Dr. Macosko.

As previously mentioned, the following tests performed by Dr. Macsoko on the HDI Product relate to whether channels are formed in the HDI Product: moisture vapor transmission rate ("MVTR"), hydrolysis, scanning electron microscopy ("SEM"), atomic force microscopy ("AFM"), energy dispersive x-ray spectroscopy ("EDS"), infrared ("IR"), moisture uptake (two

different sets),[14] and differential scanning calorimetry ("DSC") . D515b; Tr. 343:9-501:7. Each test is described in greater detail as follows:

a. Moisture Vapor Transmission Rate ("MVTR") Experiments.

Dr. Macosko conducted MVTR experiments on compositions containing polyethylene, molecular sieve, and in varying amounts EVA to measure the rate at which moisture passed through the samples. Dr. Macosko determined, based on the MVTR test of the sample composed of the HDI formulation, a dramatic increase in the rate of moisture transmission compared to the control sample without the EVA (comprising 50% molecular sieve and 50% polyethylene). D566b; D503; Tr. 365-73. Dr. Macosko concluded from these results that the significant increase in MVTR provides convincing evidence that a channel morphology exists in the HDI Product and that these results cannot be explained by the presence of pores or voids in the sample. Tr. 366-371, 391-392. Dr. Macosko applied a permeability model to his MVTR results, which, he maintains, also reveal that the HDI Product has a channel morphology. D566b; Tr. 368-75. MVTR data for experiments using polyvinyl alcohol (PVOH) as a channeling agent and samples prepared in the same manner produced results consistent with Dr. Macosko's permeability models and channel formation. D619.

SCI contends Dr. Macosko's MVTR results are unreliable because he engaged in sloppy testing techniques and lacked experience in this area. Dr. Macosko admitted that his samples with and without EVA were made by different procedures. Dr. Macosko also admitted that, outside of this case, he has never done any moisture vapor transmission research or any research on desiccant entrained polymer compositions. Moreover, it was a CSP employee, William

[14] As stated previously, we do not include in our analysis the moisture uptake tests performed by Dr. Macosko. See note 9, supra.

Spano ("Mr. Spano"), who actually made the sample compositions and sent them out for laboratory for testing. Tr. 466:2-24. And Mr. Spano admitted that the report submitted by the outside laboratory did not follow the industry standard procedure identified as ASTM 1249. Spano Dep. (10/11/05) at 126:21-128:3; PTX 114 at Exhibit E. Finally, SCI notes that the outside laboratory reported the results of its testing in correspondence sent directly to CSP's counsel, rather than to Mr. Spano or Dr. Macosko, suggesting, apparently the results were driven by this litigation, rather than by the applicable science. Spano Dep. (10/11/05) at 130:22-132:4; 132:16-134:1; D58;

Both of CSP's experts acknowledged that the existence of channel morphology can be determined by performing a series of at least four, and preferably approximately ten, experiments with incrementally increasing amounts of channeling agent and by measuring the MVTR. If channel morphology is achieved, the test results produce an S-shaped curve of MVTR as a function of the amount of channeling agent. That occurs because of a sudden increase in MVTR when the composition has enough channeling agent to form channels that transmit moisture. Tr. 297:3-298:1. In the past, Dr. Macosko has published the results of such experiments using these techniques to determine the existence of channel morphology. Tr. 469:5-470:21; PTX 71. However, Dr. Macosko did not perform this series of experiments on the HDI product or formulation, nor for that matter did Dr. Paul.[15]

Dr. Paul testified to his belief that the increased MVTR in the HDI Product formulation was due to the presence of pores, cracks, and voids in the composition. Noting that there is a four-fold increase in permeability from a composition of polyethylene alone to a composition

[15] It should be noted that nothing prevented SCI and/or Dr. Paul from performing these same experiments to prove the HDI Product does not have channels.

with 50% by weight desiccant added to the polyethylene, Dr. Paul stated that the addition of 50% by weight of desiccant makes the polyethylene porous which causes the large increase in permeability. Tr. 767:19-768:11. Dr. Paul, however, could offer no explanation for the significant increase in MVTR resulting from the addition of 8% EVA to a sample with 50% desiccant and 42% polyethylene. Tr. 890:3-14. Dr. Paul contends that some undefined portion of that increase might be due to the fact that EVA is more permeable than polyethylene causing the increase in the MVTR from the addition of EVA. Tr. 890:3-14. However, Dr. Paul admitted that adding EVA to polyethylene alone, while it increases the MVTR to a certain extent, the increase is significantly less than the doubling observed in the composition when EVA was added to composition of polyethylene and molecular sieve (the HDI Product formulation). D566b; Tr. 892:6-13.

When Dr. Paul applied the permeability model to the composition with 50% polyethylene and 50% molecular sieve utilizing Dr. Macosko's assumptions of no porosity and molecular sieves that are infinitely permeable to water, Dr. Paul concluded that the measured value of the composition was more than twice what he had calculated the theoretical value to be. To Dr. Paul, this result proved that the assumptions made by Dr. Macosko were invalid. Tr. 775:15-777:3; PTX 894. In contrast, Dr. Macosko, testified that the increase in the measured value over the theoretical value is more likely due to there being so much molecular sieve in the composition thereby causing a certain amount of the desiccant particles to touch each other and thus facilitate moisture transmission, which is something the permeability model did not take into account. Tr. 372:20-373-5.

Dr. Paul also opined that Dr. Macosko's permeability models were incorrect because Dr. Macosko assumed that molecular sieve particles are highly permeable to water whereas Dr. Paul

believes that molecular sieve is not highly permeability and, instead, that it would absorb water and hold it tightly. Tr. 769:15-771:16. In support of his contradictory view, Dr. Macosko cited an article informing that desiccant particles are highly permeable to moisture within the molecular sieve particle. Dr. Paul countered with an article written by the same author explaining that, although moisture moves around easily within a desiccant particle, it does not easily leave the desiccant particle, much like the way in which a magnet slides across the surface of a refrigerator but is difficult to pull off. Tr. 771:17-775:1; PTX 850. Dr. Macosko characterized the results discussed in Dr. Paul's article as inapplicable here because in the HDI formulation EVA surrounds the molecular sieve particles and facilitates moisture transmission. Tr. 392-394.

b. Hydrolysis Experiments.

Dr. Macosko also performed a hydrolysis test which indicated that all the EVA in the HDI Product formulation is contained within channels. Dr. Macosko's hydrolysis experiment used sodium hydroxide to convert EVA to ethyl vinyl alcohol (EVOH). The sodium hydroxide necessarily converted only EVA molecules that the sodium hydroxide was able to access. The results of Dr. Macosko's experiment demonstrated that all of the EVA in the HDI Product formulation changed to EVOH. Tr. 376-77; D522; D197. Dr. Macosko explained that the conversion of all the EVA to EVOH was possible only if channels were present in the HDI Product formulation.. Dr. Macosko further stated that cracks or pores would not explain this result because the cracks or pores would have to interconnect and reach every "blob" of EVA within the polyethylene, which he did not believe would occur. Tr. 376-77; Tr. 471:24-472:5;

D522; D197.[16]

c. Scanning Electron Microscopy ("SEM") Experiments.

Although ultimately not important to our decisions here,[17] the correct interpretation of SEM images taken of the HDI Product is one of most contested aspects of the dispute between the parties. CSP's expert, Dr. Macosko, produced SEM images at 500x, 1000x, and 3000x magnification of the HDI Product which he interprets to show an absence of pores, cracks, and voids. See D74; D75; D76; D192; D526 Tr. 351:10-354:15; Tr. 371:6-19. Dr. Macosko also examined SEM images of samples containing 50% polyethylene and 50% molecular sieve, (See D526) testifying that he did not see any cracks or pores in either of those samples either with EVA or without EVA. Tr. 371:6-19; D526. While he admitted that the SEM's of the HDI Product showed dark lines at the edges of the desiccant particles that might be interpreted as pores, Dr. Macosko believed that the cause of the dark lines was actually shadows caused by the desiccant particles existing at a different height from the polymer compound. Tr. 353:18-354:5.

SCI faults Dr. Macosko's techniques in creating the SEM images on the grounds that the magnification level was not high enough and thus his results were unreliable. SCI notes that in his published work, as opposed to his tests here, Dr. Macosko used SEM images having a magnification of 18,000-fold. PTX 143 at 3rd publication; Tr. 711:2-712:6. SCI's expert, Dr. Paul, believes that Dr. Macosko did not use a high enough magnification of SEM to be able to observe the pores. Tr. 709:18-711:1

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[16] Dr. Macosko did not test a control sample of 50% EVA and 50% molecular sieve because such a test would have been pointless since all the EVA would be accessible to the sodium hydroxide and thus would have been readily converted to EVOH. Tr. 472-474.

[17] See note 39, infra.

SCI's expert, Dr. Paul, claimed that the SEM's of the HDI Product reveal pores, cracks, and voids. He testified that he, in fact, observed such pores in Macosko's 1000x magnification SEMs. Tr. 709:18-711:1. Dr. Paul also testified that he observed pores in SEMs of the surface of the HDI product using a magnification of 8,000x. Dr. Paul noted the portion of the HDI Product he examined at 8000x was on the surface of the composition–the part exposed to the diagnostic test strips, if the product were a vial–which is not a fractured or cut surface. PTX 866; Tr. 706:14-708:1.[18] Dr. Paul further testified that it is his view that pores are visible at 2000x magnification but are less visible than the pores he observed at 8000x magnification.[19] Thus, Dr. Paul criticized Dr. Macosko's 500x and 1,000x images as being taken at too low a magnification to adequately observe pores. Tr. 709:18-711:1. However, Dr. Paul did concede that, after looking at surface images of the HDI Product, it was impossible to tell anything about the interior of the composition. Tr. 880:18-20. Dr. Paul had examined samples of the interior of the HDI Product at 5000x magnification, which he said also showed pores. According to Dr. Paul, the SEM images of the same area of the interior of the HDI Product at increasingly higher magnifications from 5,000-fold to 35,000-fold make the porosity of the HDI product clearly visible. Dr. Paul's interior HDI Product samples were microtomed (i.e. cut) by him at -150˚C, using a freshly prepared glass knife. PTX 867; Tr. 712:11-713:25.

The parties dispute which kind of knife, diamond or glass, is preferable in preparing SEM samples. Although a glass knife is not as hard as a diamond knife, Dr. Paul testified that, in his

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[18] PTX 994 is a copy of PTX 866 marked up by Dr. Paul to show the pores in the surface of the injection-molded HDI product at a magnification of 8,000-fold. Tr. 708:15-709:10.

[19] PTX 865 is an SEM of the same surface as PTX 866 except that it is at a lower magnification of 2,000-fold.

view, a glass knife is actually sharper and, therefore, he believed better than a diamond knife for preparing samples. Tr. 712:11-713:25. Dr. Macosko, however, testified that for studying samples of the HDI Product, and similar systems, a diamond knife is far superior to a glass knife for the preparation of SEM samples because a diamond knife can cut through the molecular sieve molecules with a minimum amount of disturbance of the surrounding areas. Tr. 352:14-21. According to Dr. Macosko, the molecular sieve particles are significantly harder than the polyethylene and that when he tried to prepare SEM samples using a glass knife he got inferior images. Dr. Macosko commented that the SEM images relied upon by Dr. Paul show polymer tearing and molecular sieve displacement and movement due to sample preparation utilizing a glass knife, rather than exhibiting the presence of cracks or pores. Tr. 406-408. Similarly, CSP's technical expert, Dr. Fredrickson, testified that SEM sample preparation can create the appearance of pores or voids in a composition when none exist. D39; Tr. 274-275. Dr. Fredrickson further explained that the SEM images prepared by Dr. Paul reveal a fractured surface which Dr. Fredrickson believes was "obviously prepared without any care for trying to get a smooth surface." Tr. 269:14-24; D325.

d. Atomic Force Microscopy ("AFM") Experiments.

The AFM experiments conducted by Dr. Macosko were inconclusive. Several weeks before trial, Dr. Macosko produced AFM images which he claims showed that there is a height difference across the HDI Product sample that creates the appearance of shadows in the AFM and SEM images. D339; Tr. 354:16-358:7; Tr. 860:25-861:4; 861:8-13. Dr. Macosko's AFM experiment used a "standard probe," (Tr. 436:4-9), which Dr. Paul demonstrated was physically too large to detect the cracks and pores that Dr. Macosko had attributed to the accused HDI product. Tr. 722:24-726:11; Tr. 726:24-727:3; PTX 896, 897, 898, 911.

e. Energy Dispersive X-Ray Spectroscopy ("EDS"), Infrared ("IR"), and Differential Scanning Calorimetry ("DSC") Experiments.

Dr. Macosko conducted EDS and IR experiments which demonstrated the EVA and molecular sieve were evenly distributed throughout the HDI Product formulation sample. D192; Tr. 358:8-359:17; Tr. 359:24-365:5. Tr. 740:9-23; Tr. 740:9-23; Tr. 805:12-806:22; D191. As noted above, Dr. Macosko's DSC analysis revealed that the EVA in the HDI Product formulation was in a separate phase from the polyethylene. D195; Tr. 375:9-376:7; Tr. 395:4-23.

I. Evidence Regarding EVA as a Channeling Agent in the HDI Product.

The testimony of CSP's experts reflected their agreement that EVA can function as a channeling agent in the HDI product. In our March 14, 2005, Entry on Claim Construction, we defined a "channeling agent," as used in the '937 and '255 patents, as "a hydrophilic material that is melted and forms passages throughout a polymer base." Entry on Claim Construction at 25. There is no dispute that EVA is hydrophillic in the HDI Product, as defined by the Court, or that EVA is melted during manufacturer of the HDI Product. See Factual Background Section IV(F)(3). However, the parties disagree, first, as to whether the EVA forms passages or channels through the polyethylene in the HDI Product and, second, assuming EVA is capable of forming channels, whether there is a sufficient amount of EVA present in the HDI Product to actually form channels.

1. Evidence Regarding Whether EVA Can Form Channels.

CSP's experts believe that EVA can and does form channels in the HDI Product. Dr. Fredrickson testified that EVA is a suitable channeling agent in the HDI Product because it is more permeable and hydrophillic than the polymer base, polyethylene. Tr. 306:15-22. Dr.

Macosko testified the EVA in the HDI Product forms passages and, thus, the EVA in the HDI Product is a channeling agent, as defined by the Court. See Tr. 382:17-383:5; Tr. 389:22-391:21 D519; D520; D522; D566b; see generally Tr. 343-411.[20]

SCI, however, maintains that, according to the CSP patents, EVA cannot function as a channeling agent, noting that the CSP Patents disclose only two channeling agents, EVOH (ethylene vinyl alcohol) and PVOH (polyvinyl alcohol). D1 ('937 patent) at column 6:59-61. Dr. Fredrickson had testified that EVA is structurally different from EVOH and has different properties, including a lower moisture transmission rate, because EVOH has OH (hydroxyl) groups that can participate in hydrogen bonding with water better than the acetate groups in EVA, and, unlike EVA, is soluble in water. Tr. 300:18-301:9; Tr. 485:5-8; Joint Stipulated Fact Nos. 30, 31. Dr. Macosko conceded that the CSP patents do not list EVA as a channeling agent. Dr. Paul compared the hydrophilicity of polyethylene, EVA, EVOH, and PVOH, and concluded that polyethylene is at the bottom of the scale of hydrophilicity; EVA is only slightly above it; and EVOH would be quite a bit higher; and PVOH would be much higher still since it is so hydrophilic that it dissolves in water. Tr. 741:3-742:14. 85. On cross-examination, however, Dr. Paul conceded that the scientific literature reports that the MVTR values of EVA and EVOH have overlapping values. Tr. 904:18-905:21[21],[22]

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[20] Because of the Court's prior ruling defining "channeling agent," the evidence adduced to prove EVA is a channeling agent is largely duplicative of the evidence to prove the HDI Product contains channels.

[21] SCI also notes that CSP's European patent application, which corresponds to the '937 patent, discloses that EVA is a polymer base and not a channeling agent, and discloses that the combination of polyethylene and EVA is a polymer base and not a channeling agent. PTX 54 at page 20. In addition, SCI notes that CSP's U.S. Patent Number 6,486,231(the '231 patent") identifies EVA as a hydrophobic polymer base. See PTX 92 at CSP 001370, col. 9:47-57. SCI maintains that CSP amended the application that became the '231 patent immediately after

SCI's technical expert, Dr. Paul, testified that EVA is very different from polyethylene glycol (PEG), the channeling agent in CSP's commercial product, explaining that PEG is water-soluble, while EVA is not, and EVA can be considered a moisture-barrier material while PEG dissolves in water. Tr. 818:1-819:9.

2. Evidence Regarding the Sufficiency of EVA Present in the HDI Product to Form Channels.

SCI contends there is not enough EVA present in the HDI Product to form channels. According to SCI's expert, Dr. Paul, if all of the EVA uniformly coated the molecular sieve particles in the HDI Product, the EVA layer on the desiccant particles would be only .15 microns thick, thus eliminating any extra EVA for the channels between the particles. In Dr. Paul's view, if the EVA elastomer coated the desiccant particles and also formed narrow microscopic channels between desiccant particles, the coating and channels would not be sufficiently large to conduct moisture at a useful rate. Tr. 729:18-737:2, 930:13-23; PTX 872, 873, 874, 889, 910.[23] During cross-examination, however, Dr. Paul conceded that an EVA coating of .15 microns surrounding the desiccant particles would nonetheless be approximately one thousand times larger than a water molecule. Dr. Paul also conceded that, even with such a thin coating,

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learning that the HDI Product includes EVA to claim the use of EVA as a channeling agent in a moisture-absorbing, desiccant entrained polymer product. PTX 92 at CSP 001370, col. 9:58-col. 10:2, CSP 001473-001488; PTX 394; Tr. 537:12-539:14.

[22] Dr. Macosko admitted that, according to the Lancesseur patent, (D177), the elastomers that Lancesseur discloses are used as toughening agents, not channeling agents, and EVA is one of those elastomers. Tr. 413:21-414:10. On cross-examination, Dr. Macosko explained that some of the other elastomers disclosed in Lancesseur would be considered hydrophillic, as this court has defined the term. Tr. 422:22-424:12.

[23] On the other hand, Dr. Paul maintained that pores or voids or cracks that had a dimension of .15 microns would be an effective conduit for moisture because the permeability through a pore is orders of magnitude greater than through any polymer. Id.

multiple water molecules could simultaneously permeate the EVA. Tr. 870-871. Dr. Fredrickson demonstrated the weakness of Dr. Paul's theory stating that it fails to properly take into account the role of the base polymer in filling the gaps between desiccant particles. See Tr. 260-62; D533. Dr. Fredrickson also explained that Dr. Paul's opinion was in error in claiming that there was not enough EVA to form channels because it is based on the incorrect assumption that 100% of the molecular sieve must be encapsulated by the EVA. Tr. 729:1-17; 733:22-25; 737.

CSP maintains that the experimental evidence demonstrates that 8% EVA is sufficient to form channels. CSP notes that, based on his experiments, Dr. Macosko determined that 8% EVA is enough to form channels in the HDI Product formulation. See D519; D520; D566b; D522; Tr. 361-404. In addition, Dr. Fredrickson's research revealed that between 5% and 10% channeling agent was sufficient to form channels in certain systems. See D41; Tr. 239-41; D39; D40; Tr. 250-54.

J. Evidence Regarding SCI's "Layered Theory" for the HDI Product.

SCI presented evidence from Mr. Dessus that the HDI Product is layered, that is, that the desiccant in the HDI product is primarily located near the surface of the composition. SCI appears to have withdrawn this assertion in light of the substantial evidence to the contrary.[24]

V. Validity

[24] For example, energy dispersive x-ray spectroscopy ("EDS") shows that the molecular sieve desiccating agent in the accused HDI Product is evenly distributed across the entire sample. D192; Tr. 358:8-359:17; Tr. 740:9-23; Tr. 805:12-806:22. Infrared ("IR") analysis shows that the EVA channeling agent and molecular sieve desiccating agent in the HDI Product is evenly distributed across the entire sample. D191; Tr. 359:24-365:5. Tr. 740:9-23; Tr. 805:12-806:22. Dr. Macosko testified that the layered theory defies common sense for many reasons. Tr. 400:14-401:20. Even SCI's technical expert, Dr. Paul, told SCI's attorneys he saw no evidence to support the layered theory. Tr. 910-911.

SCI asserts that the CSP patents are invalid and, obviously, CSP disagrees. There are numerous factual disputes between the parties which relate to a patent validity analysis, including: who is a person of ordinary skill in the art; do the CSP patents enable one of ordinary skill in the art to practice the patented technology; do the CSP patents contain an adequate written description of the patented technology; does the Lancesseur patent anticipate the CSP patents; and does Lancesseur render the CSP patents obvious? We discuss the evidence concerning each of these issues below.

A. A Summary of the Evidence Regarding a Person of Ordinary Skill in the Art

The parties dispute what is the proper level of skill in the art from which to evaluate the CSP Patents. CSP claims that a person of ordinary skill in the art should be someone with a Ph.D.-level education and at least five years of design experience, both in a relevant field. SCI contends a person of ordinary skill in the art is a person with a bachelor's degree and five years of work experience, both in a relevant field.

According to CSP's expert, Dr. Fredrickson, based on his industrial consulting experience, the CSP patents involve designing speciality polymer formulations. Dr. Fredrickson testified that the people who design speciality polymer formulations are individuals with a Ph.D. in chemistry, physics, chemical engineering, material science or polymer science and at least five years of experience in the design of multiphase polymer alloys. Such a person who possesses this level of education and experience, in Dr. Fredrickson's judgment, is a person skilled in the art to whom the CSP patents are directed. D551; Tr. 255:5-256:2. The inventor of the CSP patents satisfies Dr. Fredrickson's definition of a person skilled in the art. Tr. 256:3-8. Dr. Fredrickson testified that bachelor degree level engineers with manufacturing responsibilities do not design or select components for channel morphologies like those described and claimed

in the CSP patents. Tr. 256:4-18.

In contrast, SCI's expert, Dr. Paul, testified that, based on his experience with companies in the polymer field, people with Ph.D.s would be expected to be the innovators, while people with bachelor's degrees would be the ones to carry out such tasks as practicing the teaching of a patent. Tr. 820:5-18. Dr. Paul is of the view that, with respect to the CSP patents, the person of ordinary skill in the art would have a bachelor's degree in chemical engineering, polymer science, or chemistry, and five years of experience in the field of manufacturing plastic articles. Tr. 742:24-743:2, PTX-903. Dr. Paul identified several people working at CSP and SCI who satisfy his definition as persons of ordinary skill in the art, including William Spano ("Mr. Spano") and Sumeet Kumar ("Mr. Kumar") at CSP, Francois Dessus ("Mr. Dessus") and Eric Judek ("Mr. Judek") at SCI, and Jean-Pierre Giraud ("Mr. Giraud"), who has worked for both CSP and SCI. Tr. 820:19-24, 821:8-13.

SCI points out that all the individuals identified by Dr. Paul have design responsibilities at their respective companies. Mr. Spano is the Technical Director of CSP Technologies, whose job description includes the responsibility, among other things, to "[d]evelop new products and formulations to meet customer and/or market requirements." Spano Dep. 7:16-18; PTX 494 at 1. The educational and work experience for a person occupying Mr. Spano's position is "Minimum BS in Chemistry or related field" and "Five years experience in polymeric materials science." PTX 494 at 1. Mr. Kumar was a project engineer for CSP Technologies between 2000 and 2002 with a bachelor's degree in chemical engineering in 1995 from Bangalore University in India and a master's degree in polymer engineering in 1998 from the University of Akron. Kumar Dep. 5:12-6:4. Mr. Kumar was hired to work on specific projects at CSP, including a project on new channeling agents, a project on release of odor fragrance, and a project on scavenging gases.

Kumar Dep. 8:14-25. Mr. Judek, who has an undergraduate degree in chemistry, worked on developing 2AP formulations at Airsec between 2000 and 2002. Judek Dep. . 6:6-13; 7:7-23. Mr. Giraud was the director of research and development at Airsec for approximately ten years beginning in 1989, during which time he was involved in research related to Airsec's 2AP products. Tr. 88:15-21; 89:2-90:6.

B. A Summary of the Evidence Regarding Enablement of Claimed Invention for a Person Skilled in the Art.

Dr. Fredrickson recounted that the disclosures in the CSP patents enabled him to understand and practice the full scope of the claimed inventions. Tr. 202:21-203:4; 210:23-211:25; 219:20-22; 219:23-226:17; 239:23; D41; D38; D39; D40. Dr. Fredrickson concluded that, based on his definition of a person skilled in the art, the CSP patents teach one skilled in the art the manner in which to make the claimed channel technology and also enable such a person to practice the claimed inventions. Tr. 237:25-238:2; 256:19-257:5. Dr. Fredrickson also testified that, based on his research, he discovered that one cannot achieve channels unless a composition contains between at least 30% and 40% by volume of a desiccant particles, which he was able to determine with very little experimentation. Tr. 283:21-25; Tr. 307:20; D38-41. A person of ordinary skill in the art, according to Dr. Fredrickson, could also determine the minimum amount of channeling agent necessary to obtain channels by following the teachings of the patents-in-suit without undue experimentation. Tr. 307:21-25. Based on his research, Dr. Fredrickson explained that there must be a preferential affinity beyond mere polar attraction between the desiccant and the channeling agent for channels to form (because the preferential wetting of the desiccant particles by the channeling agent involves surface energies,

not just polarity). Tr. 287:14-288:9.[25]

At trial, Dr. Fredrickson explained several experiments he performed on compositions demonstrating they formed (or did not form as the case may be) channels. The most persuasive tests performed by Dr. Fredrickson was fluorescent microscopy. Dr. Fredrickson conducted fluorescent microscopy on composition, which he believed contained channels. Dr. Fredrickson explained that for the fluorescent microscopy experiment he first soaked a composition composed of 60% desiccant particles, 30% polymer base, and 10% channeling agent in water to dissolve the channeling agent and then re-soaked the composition in a dye solution. The resulting images of the composition show that the fluorescent dye penetrated deep within the interior of the composition. D40; Tr. 253. Dr. Fredrickson testified that this experiment confirmed that the composition had channel formation. Tr. 253. Dr. Fredrickson performed the same fluorescent microscopy experiments on a composition composed of 60% desiccant and 40% polymer base; however, the resulting images showed that the florescent dye remained only on the surface of the composition and did not penetrate into the interior. D40; Tr. 254. Dr. Fredrickson testified that this result demonstrated there were no channels in the second composition. Tr. 254. Dr. Fredrickson also testified that, if there were cracks or pores in the composition with 60% desiccant and 40% polymer, the fluorescent dye should have penetrated into the interior of the composition. Tr. 254. Dr. Fredrickson also ran fluorescent microscopy experiment that he claimed demonstrated channels in composition with only 5% channeling

[25] SCI notes that Figures 2 and 3 of the CSP patents apparently describe a uniform distribution of the desiccant throughout a composition using the claimed technology, which implies there is no preferential affinity between the desiccant and the channeling agent. See D-1, '937 patent, 12:37-56. SCI also notes that the preferential affinity described in the specification is based solely on polarity and is described as merely being "advantageous." D-1, '937 patent, 8:17-43.

agent (and either 50% or 65% desiccant with the remainder composed of polymer base). See D41.

Dr. Fredrickson also performed transmission electron microscopy ("TEM") images of extremely thin slices of a composition a polyethylene, polyox (channeling agent) and molecular sieve composition. The samples were stained with a dye which preferentially binds to the different component parts. Dr. Fredrickson explained that the TEM images revealed that the channeling agent formed "halos" around the desiccant, completely coating the desiccant particles. D38.006; Tr. 241-243. Dr. Fredrickson's TEM images were made from a sample with only 15% desiccant because his research assistant found she could not cut thin enough samples of compositions with higher percentages of desiccant. Dr. Fredrickson prepared other TEM samples with higher desiccant percentages by replacing the hard desiccant particles with a softer plastic particle. Dr. Fredrickson testified that the TEM images of composition with 40% desiccant revealed extended pathways of channel agent and particles by which moisture could travel from the exterior into the interior of the sample. D41.005; Tr. 244-249. In samples with only 20% plastic particles, however, Dr. Fredrickson testified the TEM did not reveal channel formation. D41.005; Tr. 248.

Dr. Macosko also read and understood the CSP patents prior to this litigation and testified that the patents-in-suit enabled him to make compositions that practice the claimed inventions. D204; D619; Tr. 417:5-418:13. D274; Tr. 416:17-21; Tr. 418:14-21; Tr. 344:23-347:10;. Dr. Macosko opined that the CSP patents teach an ordinary person skilled in the art, as defined by Dr. Fredrickson, how to create and obtain the claimed channel structure.

Tr. 416:17-24.[26]

SCI's expert, Dr. Paul, contradicted CSP's experts, testifying that he did not believe the CSP patents enabled one skilled in the art, according to his definition of that person, to understand and practice the claimed inventions. Dr. Paul notes that the specification in the CSP patents contains no working examples or specific recipes to follow. See generally D-1 ; D-3; Tr. 823:4-5. Further, he notes that the CSP patents disclose only two base polymers—polyethylene and polypropylene—and two channeling agents—polyvinyl alcohol (PVOH) and ethylene vinyl alcohol (EVOH)—although the CSP patents purportedly cover numerous other choices for both of these components. Tr. 822:23-823:3; D-1, '937 patent, 6:45-49 and 59-61. Dr. Paul stated that he, himself did not know, and in fact a person of ordinary skill in the art, as he defines such a person, would not know, that at least 30% and 40% percent by volume of desiccant particle is necessary to form channels. Tr. 826:24-827:10; Tr. 827:14-18; see also Kumar Dep. 11:1-22, 15:3-19, 28:25-29:17. Dr. Paul believes that a significant amount of experimentation would be required to discover that there is a minimum amount of desiccant required to achieve channels. Tr. 828:6-829:1. Having never attempted the task himself, however, of making any compositions in order to actually determine if the patents were enabling or if the minimum amount of desiccant necessary to form channels could be determine without undue experimentation, his conclusions necessarily are only hypothetical. Tr. 921:8-25.[27]

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[26] CSP notes that SCI was able to reproduce the patented technology based on a related European patent application filed by CSP. As the European patent application contains different disclosures than the patents in suit, this evidence is not relevant to our decision in this matter. See Tr. 333:25-336:23; PTX 54.

[27] SCI adds that the inventor of the patented technology, Dr. Hekal, testified that, without knowing the relative amount of the components in a mixture, he could not predict whether particular combinations of polymers and desiccant would result in channels without going

C. Summary of Evidence Regarding the Written Description of the Patented Technology.

SCI contends that the written description of the patented technology in the CSP patents is insufficient. SCI notes that each of the claims of the '937 and '255 patents requires the combination of three different materials—a "polymer" ('937 patent) or "polyolefin" ('255 patent), a "channeling agent", and a "desiccating agent"—combined in a way that will create "sold pathways that extend throughout the polymer base from the exterior surface of the plastic structure into its interior." March 14, 2005, Entry on Claim Construction at 25. SCI further notes that the CSP patents contain no working examples that set forth an actual formulation that achieved channels and that there are no suggestions of percentage ranges for any of the three components. See generally D-1 and D-3. The only disclosure in the CSP patents of '937 the relative amounts of the three components is found in the following passage, which appears in both patents:

> It has been found that the higher the desiccant concentration in the mixture, the greater the absorption capacity will be of the plastic structure created therefrom, however, that body will be more brittle and the mixture will be more difficult to either thermally form, extrude or injection mold. For that reason, it has been found to be advantageous to have a maximum desiccant load of approximately sixty percent by weight with respect to the polymer base. It is preferred to maintain the load within a forty-five to fifty percent range for optimum performance in certain applications such as those that require a rigid structure. Similarly, in the instance of polypropylene being used as the polymer base or phase, its content should be maintained at about forty percent by weight, or greater to assure its performance characteristics.

D1 and D3, col. 8, lns. 49-57.

Dr. Fredrickson testified that he understood the phrase, "with respect to the polymer

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through the process of combining them and testing the result for moisture uptake. See, e.g., Hekal Dep., Vol. 1, 33:3-35:2, 39:5-40:14, 44:7-45:22, 51:18-52:12.

base," to refer to weight percentages in terms of the total composition: "It's certainly my experience that when you talk about weight percentages or volume percentages or mole percentages, you're always talking about a percentage of the overall composition." Tr. 225-226. SCI's expert, Dr. Paul, agreed that "[u]sually a percentage refers to the total composition," although Dr. Paul otherwise claimed not to understand the language in the CSP patents. D168 at 106. SCI notes that, during trial, Dr. Macosko was asked to perform a simple calculation using similar "percent by weight with respect to [another component]" language as appears in the CSP patents and, although initially Dr. Macosko interpreted this language to mean as a percent of the total composition, after prompting by SCI's attorney, Dr. Macosko completed the calculation as a percent of one with respect to another. Tr. 482:2-21.[28]

SCI also notes that, during prosecution of the '255 patent, CSP added an additional limitation to Claim 1 (and by extension dependent Claim 6) namely, that the polymer be at least about 50% by volume of the entire composition. D-4 at CSP000109 and 000111. SCI reports, however, there is no reference to volume percents in the specification of the CSP patents. D1; D3. Dr. Macosko and Dr. Fredrickson both testified that a person of ordinary skill in the art can readily convert weight to volume percentages. Tr. 263:8-11; Tr. 419:1-24. Indeed, Dr. Fredrickson noted that even an undergraduate engineering student can convert from weight to volume percentages. Tr. 263. In order to convert weight percents to volume percents, he said,

[28] SCI also points out that one of the articles on which Dr. Macosko relied describes a formulation using both weight percents with respect to the total composition ("PP powder (40 wt%), CaCO3 filler (60 wt%") and, immediately following that passage, weight percents with respect to other components in the formulation ("the antioxidant (1.3 wt % of PP), and the additive (2 wt% of CaCO3 filler"). D-211, at 1543 of first article in exhibit.

one must know the density of each component in the composition. Tr. 292:16-18, 293:23-25.[29] In contrast, Dr. Paul opined that, based solely on the information contained in the CSP patents, there is no guidance for converting from a weight percent to a volume percent. Tr. 837:19-25. SCI noted that Dr. Fredrickson conceded in his testimony there are several hypothetical compositions with 40 percent by weight of polymer that would not have at least 50 percent by volume of polymer. Tr. 292:19-193:12.

D. Summary of Evidence Regarding Anticipation and Obviousness.

Because both of SCI's prior art invalidity defenses-anticipation and/or obviousness-are based on a single prior art reference, United States Patent Number 5,432,214 ("Lancesseur" or "the Lancesseur patent"), we address these issues together, first by examining the general background facts relating to anticipation and obviousness and then by reviewing the Lancesseur patent specifically.[30]

1. General Facts Regarding Anticipation and Obviousness.

Dr. Fredrickson testified that the channel technology was not obvious to those skilled in the art at the time of the invention, stating as follows: "So the first time I read the CSP patents, I almost fell out of my chair because it was so easy to practice because it had the third component [desiccating agent] in it." Tr. 219:7-16; Tr. 226:18-227-10; D271. On this point, SCI's expert, Dr. Paul, appears to agree with regard to anticipation and obviousness, stating in his expert report: "The prior art does not teach a skilled artisan how to obtain co-continuous [channel]

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[29] SCI maintains that, during prosecution of the '255 patent, CSP advanced a different explanation for the disclosure of the 50% limitation in the patents-in-suit. See D4 at CSP000111.

[30] At trial, SCI waived all prior art defenses except the Lancesseur patent. Tr. 342:17-343:5.

morphology in a system of two polymers and a desiccant such as disclosed in the asserted patents without an enormous amount of experimenting and inventive skill." D168, Dr. Paul Report at 77.

CSP emphasizes that more than 100 prior art references were considered by the United States Patent and Trademark Office ("USPTO") in connection with the prosecution of the '937 patent, and more than 85 prior art references were considered by the USPTO in connection with the prosecution of the '255 patent. Joint Stipulation Fact Nos. 12, 13. The USPTO specifically noted and considered the Lancesseur patent during the prosecution of the '937 and '255 patents, and granted the patents over the Lancesseur patent. Joint Stipulated Fact No. 14; Tr. 411:23-412:3; Tr. 610:25-611:3; D1; D3.

2. Evidence Regarding Lancesseur.

SCI relies solely on Lancesseur for its prior art defenses. The Lancesseur patent discloses the following:

> A dehydrating plastics material composition of high moisture-absorption capacity, comprising:
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> A) 50% to 80% by weight of one or more compatible thermoplastic or thermosetting polymers;
>
> B) 20% to 50% by weight of one or more dehydrating agents;
>
> C) 2% to 8% by weight of one or more elastomers; and
>
> D) 1% to 4% by weight of fibers of lengths lying in the range 0.5 mm to 4 mm, the fibers being selected from: synthetic fibers, vegetables fibers, and animal fibers.

Joint Stipulated Fact No. 15; D177.

Lancesseur teaches that in applying this invention, one can use polyolefins, including polyethylene (which is used in the HDI Product), and polypropylene, as the thermoplastic or

thermosetting polymers, and that the polymer component of the mixture should be extruded, which is a melt-mixing technique . D177/PTX 17 col 1 lns. 53-56, col 2, lns 25-29; Tr. 809:23-810:2; Tr. 299:2-5. Lancesseur further teaches that dehydration agents, such as silica gels and molecular sieves, are "homogenously mixed" into the composition. D177/PTX 17 col 1 lns. 60-61, col. 2 lns. 12-15; Tr. 810:2-4. Lancesseur specifically identifies EVA (which is used in the HDI Product) as an elastomer. D177/PTX 17 col. 1 ln. 67; Tr. 810:4-5. Lancesseur describes solidifying the mixture into, for example, "various shapes such as hollow cylinders or plates" or a "3 mm thick plate." D177/PTX 17 col. 1 lns. 8-9, col. 2 ln. 51. The Lancesseur patent states that "[t]he invention also provides a package or container whose inside surfaces are constituted by a plastics material having a composition of the invention." D177/PTX 17 col 2 lns. 30-32, col. 1 lns. 5-11.

CSP notes that Lancesseur does not disclose anything related to the claimed technology (i.e., channel formation) of the CSP patents. D177/PTX 17; Tr. 413:4. Dr. Macosko explained that, according to Lancesseur, the elastomers disclosed there are used as toughening agents, not channeling agents, and EVA is one of those elastomers. Although Dr. Macosko admitted that some of the elastomers disclosed in Lancesseur would be considered hydrophillic, as this court has defined the term, Dr. Macosko also stated that Lancesseur does not disclose, teach or suggest using an elastomer that is more hydrophilic than the polymer base or that the desiccant should have a greater attraction to the elastomer than to the polymer base. Tr. 413:21-414:13; Tr. 422:22-424:12.[31] In Dr. Macosko's view, compositions that fall within the ranges disclosed in

[31] Dr. Macosko specifically identified "the styrene-containing ones" [one of which is styrene-ethylene-butadiene-styrene copolymer (SEBS), the elastomer used in the Lancesseur working examples], ethylene acrylate, butadiene acrylonitrile, and polychloroprene. Tr. 422:11-424:5.

the Lancesseur patent do not necessarily form channels and none of the examples disclosed in the Lancesseur patent would form channels. D177/PTX 17; D200; Tr. 414:22-415:25; Tr. 416:1-4. Further, Dr. Macosko reported that many of the elastomers disclosed in the Lancesseur patent are hydrophobic compared to the polymer base and, by definition, such elastomers would not function as channeling agents. Tr. 491:3-14. Tr. 424:6-12. Dr. Macosko also explained that the difference between the claimed invention and the Lancesseur patent includes the patented technology (i.e. channel formation) and that the Lancesseur patent does not teach, disclose, suggest or instruct one of skill in the art to make a composition with channels. Tr. 413; Tr. 416:5-16. Indeed, according to Dr. Macosko, there is no motivation or teaching in the prior art to modify Lancesseur to arrive at the patented technology. Tr. 413.

The experts agree that some, but not all, of the compositions disclosed in Lancesseur could form channels. Dr. Fredrickson, Dr. Paul, and Dr. Hekal all concurred in the judgment that the presence of a small amount of fibers, as required by Lancesseur, would not prevent channels from forming in a composition that would otherwise have channels. See Tr. 299:25-300:17, 815:22-816:9; Hekal Dep., Vol. 1, 53:5-54:3. Dr. Paul testified that, if the HDI Product actually has channels, he could not see how at least some compositions described in Lancesseur would not have channels as well; however, again, Dr. Paul did not conduct any experiments on compositions disclosed in Lancesseur to determine if such compositions do actually form channels. Tr. 816:10-21; Tr. 916:16-23. Dr. Paul also stated he did not know if channels formed in all of the combinations of materials disclosed in the Lancesseur. Tr. 916:24-917:1. On the other hand, Dr. Fredrickson agreed with SCI's attorneys that several compositions that differ from the express teaching of Lancesseur (because they have less polymer base) would form channels. Tr. 299:8-24.

SCI contends that, prior to the Hekal inventions, there were suggestions to mix elastomers with polymer bases, noting that it was known in the industry that by adding large amounts of desiccant to a polymer composition, the composition would become harder to process through injection molding or extrusion, but that those problems could be ameliorated by adding elastomers, for example, as recommended by Lancesseur. Tr. 91:22-92:11; Tr. 317:10-24. Dr. Paul testified that elastomers, like EVA, are added to polymer mixtures with high desiccant loads to make them process more easily, to improve their flexibility, and to reduce their brittleness. Tr. 808:20-809:3. Dr. Paul also stated that it is well known in the art that, in mixing polymers, one chooses polymers with common constituents (also known as monomers) because they mix together better. Tr. 814:15-815:21.[32]

VI. Credibility of Witnesses.

Both parties have attempted, with varying degrees of success, to impugn the credibility of their opponent's expert witnesses. Our determinations of witness credibility, where relevant, have been interspersed with our factual narrative. Here, we offer some more generalized witness credibility assessments.

The testimony of two of SCI's fact witnesses, Dr. Dick and Mr. Crossno, was materially impeached by their responses on cross-examination. Specifically, the Court found Dr. Dick's testimony to lack persuasive force.

Regarding the testimony of SCI's technical expert, Dr. Paul, what he was able to testify

[32] In addition to the facts mentioned above, the parties dispute facts relevant to a secondary considerations analysis, which the Court has referenced in Factual Background Section III, supra. The parties also spend considerable time and effort disputing whether SCI copied the CSP technology in order to develop the HDI Product. Since it is not necessary to resolve these factual disputes in order to reach our decisions here, we decline to enter this morass.

to and did testify to was largely controlled and directed by SCI's attorneys. For example, Dr. Paul was not engaged to perform any independent testing of the HDI Product; SCI's attorneys relied instead on outside laboratories for the tests it chose to have conducted.[33] In fact, Dr. Paul testified that it was not his role to request that additional testing be performed; instead, Dr. Paul's task was simply to opine on the images and evidence which were passed on to him by SCI's attorneys. Tr. 845-847; 899:4-900:6. In addition, an attorney for SCI, Dr. Stipkala, actually typed up Dr. Paul's expert report for him. Tr. 867:4-14. Dr. Paul's testimony at times deteriorated into little more than an exercise in semantic gamesmanship; at one point, for example, he claimed that he could not understand the Court's claim construction, although, despite his confusion, he was nonetheless able to render an expert opinion that the CSP Patents

[33] In explaining why he did not perform any tests himself, Dr. Paul initially claimed it would have been illegal for him to perform test in his own labs at the University of Texas, which prompted the following exchange on cross-examination:

> Q: And isn't it the case that you could have set up a service contract or sponsored-research agreement whereby SCI paid your lab for services?
>
> A: It's possible; however, my university would probably have balked at any contract where the results of that work would not be publishable.
>
> Q: So that's a little different than saying its illegal, right? That's a little different than saying it's against the law, isn't it?
>
> A: Okay, if you wish to say it that way, regulation, laws, practice, either way.

Tr. 849-850. Dr. Paul's contention that he was not authorized to perform any tests himself was further undermined when, upon cross-examination, he revealed that the University of Texas has a separate research organization, the Texas Materials Institute, that allows outside companies to use the resources of the University of Texas to perform tests and analysis and which is, in fact, directed by Dr. Paul. Moreover, the Texas Materials Institute apparently has the capability to perform some of the tests at issue in this litigation, including SEM and AFM tests. Tr. 851-855.

were invalid. Tr. 863-869; Tr. 868:9-12 (stating, by way of explanation, in an obvious attempt to endear himself to the Court, that "I cannot possibly know what the Judge had in her head"). These issues left the Court with serious doubts both as to Dr. Paul's independence as an expert and the scientific reliability of Dr. Paul's opinions and conclusions at trial.

With respect to CSP's technical experts, Dr. Fredrickson and Dr. Macosko, we credit Dr. Fredrickson's testimony as fully trustworthy and reliable, though we were left with some reservations concerning the reliability of certain of Dr. Macosko's test results. Regarding Dr. Fredrickson's testimony, no serious challenges were raised to its completeness or scientific reliability. Regarding Dr. Macosko's experiments, the irregularities in procedures and data, as SCI has pointed out, include: his lack of prior research on desiccant entrained polymers, his lack of prior MVTR research, the variances in methodology utilized in the samples he prepared for his MVTR tests, (see Factual Background Section IV(H)(2)(a), supra), and the unreliability of his moisture uptake results and procedures, (see note 9, supra). While we have remaining doubts concerning these results and their reliability, we do not question the credibility of Dr. Macosko's testimony which did not depend on the reliability of his test results.

VII. CSP's Motion to Strike.

The parties have jointly agreed to strike certain portions of the trial testimony from the record.[34] The Court accedes to the parties' request and, accordingly, we do not considered the portions of testimony so stricken.

CSP has also filed a separate motion to strike certain disputed testimony from the record,

[34] The parties have agreed to strike the following transcript lines from the record: 714:23-25; 715:14-16; 716:21-23; 717:23-25; 746:7-12; 748:17-749:15; 751:4-23; 752:7-13; 763:1-5; 811:20-814:13; 829:2-15; 522:19-25; and 564:17-20. See Stipulation to Strike Testimony from Trial Record at 1.

namely, the testimony by SCI's expert, Dr. Paul, concerning preferential affinity and certain testimony by SCI employee, Dr. Dick, regarding his conversations with SCI's patent counsel. SCI maintains that these disputed portions of testimony were properly admitted at trial and should be considered by the court. Our review of the record brings us to the conclusion that the challenged testimony by Dr. Paul and Dr. Dick should be stricken and, thus, we GRANT CSP's Motion to Strike in its entirety. We nonetheless examine the challenged testimony of each witness below.

CSP correctly asserts that Dr. Paul should not have been allowed to testify about "preferential affinity" at trial because he did not discuss his theories on this matter in his expert report. Although SCI maintains that Dr. Paul's initial expert report addressed "preferential affinity," SCI cannot point to any references to preferential affinity or any analogous term in Dr. Paul's report. In SCI's misleading response, it interspersed a quote from Dr. Fredrickson's deposition testimony into a discussion of Dr. Paul's expert report in order to make it appear as if Dr. Paul had also discussed "preferential affinity." In fact, Dr. Paul did not address this issue. In the cited portion of his deposition testimony, Dr. Fredrickson made reference to "preferential wetting forces;" however, this topic was never addressed by Dr. Paul. Moreover, the cited portion of Dr. Fredrickson's deposition testimony primarily involved a discussion of the Rayleigh mechanism and how the presence of particles inhibit the collapse of channels, which is the topic referenced in Dr. Paul's expert report but about which Dr. Paul explicitly stated he might explain further if asked.[35] There is no similar indication that Dr. Paul included testimony

[35] See, Motion to Strike Resp. Ex. C at 101, n. 8 ("If asked, I may explain my understanding of the Rayleigh mechanism and other mechanisms influencing polymer blend morphology).

concerning "preferential affinity" in his report or his deposition and, thus, his testimony at trial regarding this topic was improper. Accordingly, we GRANT CSP's motion to strike all testimony by Dr. Paul concerning "preferential affinity."[36]

CSP also moves to have portions of Dr. Dick's testimony stricken which reflect advice he received from counsel, per the parties' agreement and the Court's order during trial. The disputed testimony concerns a document produced by Dr. Dick, PTX 849, which SCI introduced on direct examination. During cross-examination, Dr. Dick admitted that a critical portion of the document reflected advice he had received from SCI's attorneys, but Dr. Dick refused to divulge the contents of that advice beyond the brief mention contained in the document. Instead of waving the attorney-client privilege with respect to the conversations between Dr. Dick and SCI's attorneys, SCI offered to strike the offending portions of testimony from the record. In making this offer, however, SCI's attorney, Mr. Sokal, maintained that the only portion of the transcript that needed to be stricken was "just that one answer," which Mr. Sokal had elicited on direct examination, to which the Court responded:

> No, it's more than that, counsel, because throughout his testimony . . . as [Dr. Dick] was describing his actions and steps that he took, part of his own behaviors, his own reflections, reflected what he had learned from the attorneys.

Tr. 581:21-582-4. After a brief side discussion, Mr. Sokal stated to the Court:

> I'm happy to drop the document [PTX 849]. I'm happy to drop his answer. And if you feel that there's testimony that relates to what the attorneys told him . . . I'm happy to drop any of that.

Tr. 581:17-22. In response to this offer from SCI, the Court ruled as follows:

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[36] The following lines of testimony from Dr. Dick are hereby stricken from the record: 520:17-19, 527:6-25, 523:12-19, 560:3-561:5, 563:16-565:15

> I will allow you to strike from the record any testimony that the witness has previously given that reflects or relates to the advice of counsel. And to the extent he was reacting to his knowledge -- I should say he was reacting on the basis of what the attorneys were advising as he went along, that too will be stricken.

(Tr. 581:23-582:5). After the trial concluded, the parties jointly agreed to strike certain portions of Dr. Dick's testimony (see the Joint Stipulation to Strike above), but SCI thereafter apparently has refused to honor the concession it made to the Court.[37] The clear unreasonableness of SCI's revised position is obvious from a review of the questions (and respective answers) that SCI now seeks to have retained as part of the record, including:

> Q: "And you testified earlier – and we can go back and find the testimony if we need to – that you were referring to the fact that your patent lawyers had told you you had non-infringement grounds for five of the six patents, correct?"
>
> * * * * *
>
> Q: "What was the advice that you [Dr. Dick] received from the [SCI] attorneys related to noninfringement as it pertains to the patents-in-suit?"
>
> * * * * *
>
> Q: "Who were the [SCI] attorneys who gave you the advice?"

Tr. 560:3-561:5, 563:16-564-15.[38] We can fathom no plausible explanation for SCI's assertion that the questions and the responses elicited do not "reflect or relate to the advice of counsel"

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[37] SCI apparently interprets the Court's ruling to mean striking "only [the] portion of Dr. Dick's direct testimony that arguably 'could buttress his own conclusions by referring to the fact that he had discussions with attorneys during his investigations.' " SCI's Resp. to Motion to Strike at 3 (quoting a June 19, 2006, letter from CSP). SCI also apparently believes it does not need to strike any material elicited by CSP on cross examination which does extend beyond the document prepared by Dr. Dick. Id.

[38] We do not reproduce here Dr. Dick's answers to these questions since this testimony is stricken from the record. We merely reproduced the offending questions to demonstrate the pure unreasonableness of SCI's posturing.

which Dr. Dick received from SCI's attorneys. SCI's eleventh hour refusal to honor its agreement to strike the disputed testimony is totally disingenuous, in our view, in light of the statements made by SCI's attorney, Mr. Sokal, to the Court in his colloquy attempting to persuade us to agree to this procedure. Mr. Sokal offered to strike from the record PTX 849 and any testimony by Dr. Dick "that relates to what the attorneys told him," and it is that offer reflected in and responded to by the Court's order. Accordingly, CSP's Motion to Strike portions of Dr. Dick's testimony is GRANTED and the following lines of testimony are hereby stricken from the record: 520:17-19, 527:6-25, 523:12-19, 560:3-561:5, 563:16-565:15.

Because we view the resurrection of this previously resolved–indeed, stipulated to–issue by SCI as improper and in total disregard not only of its duty of candor to the Court but to opposing counsel as well, SCI is hereby ORDERED to pay CSP's legal fees that CSP incurred in preparing and briefing the Motion to Strike.

Legal Analysis

I. SCI's "Pore" Theory Is Without Evidentiary or Legal Merit.

Before addressing the issues of patent infringement and validity, we begin our legal analysis by resolving the troublesome and, in our view, unsubstantiated "pore theory," which SCI has repeatedly advanced to counteract the evidence of structural channels as advanced by CSP. Because this "pore" theory affects almost all of SCI's arguments, we address it before moving to the other issues developed at trial.

SCI contends, through its expert, Dr. Paul, that the introduction of large quantities of molecular sieve into a polymer necessarily causes the formation of cracks, pores, and voids, and it is those cracks, pores, and voids, he asserts, that cause what CSP incorrectly describes as channels. We do not view the evidence adduced at trial to support SCI's characterization or

analysis.

For starters, Dr. Fredrickson, SCI's expert, by utilizing a process of fluorescent microscopy, demonstrated a complete absence of pores and voids in CSP's patented channel compositions. Dr. Fredrickson's tests demonstrated that by infusing a fluorescent dye, the channel became observable when the substance penetrated across the entire sample consisting of a channeling agent and 50% desiccant. In contrast, none of the dye penetrated the sample containing 60% desiccant and the channeling agent. D40; Tr. 253-254. This experiment revealed that the florescent dye migrated through the channel structure of the former sample but not of the latter. If, as Dr. Paul contends, adding at least 50% (by weight of) desiccant particles to a polymer base always increases to a "significant degree [the] porosity," there would be a "significant degree of porosity" in the sample with 60% desiccant and the florescent dye would have permeated throughout the sample. Tr. 254. That result, as Dr. Fredrickson demonstrated, however, simply did not occur.

Similarly, Dr. Macosko's hydrolysis testing results cannot be explained by reference to pores or voids. Dr. Macosko's experiments revealed that, through hydrolysis, all the EVA in the HDI product was converted into EVOH. Tr. 376-77:19; D522; D197. Dr. Macosko's results are consistent with a channel morphology, and, he stated, to produce this same outcome through a morphology consisting of cracks, pores, or voids would require "very special cracks" that somehow reached every pocket of EVA. Tr. 377. The "very special cracks" phenomenon makes this explanation highly implausible, and not even Dr. Paul suggested that the cracks, pores, or voids in these compositions formed such inter-connected structures. See Tr. 884.

Comparisons of the MVTR data for compositions containing combinations of polyethylene, molecular sieve, and EVA also contradict the pore theory. Testimony established

that, by adding 8% EVA to a composition of polyethylene and molecular sieve, the MVTR factor doubled. See D566b; D503; Tr. 365-73; Factual Background Section IV(H)(2)(a), supra. If, as Dr. Paul and SCI claim, pores and voids account for the increase in MVTR of the samples containing EVA, as compared to samples without EVA, the presence of EVA would theoretically significantly increase the amount of cracks, pores, and voids in the composition. See Tr. 370-372. Dr. Macosko theorized, however, that the introduction of EVA should decrease the amount of cracks, pores, or voids in a composition because the EVA is "more of a rubbery material." Tr. 500. Although Dr. Paul expressed no opinion concerning whether the introduction of EVA would increase the presence of pores or voids, see Tr. 890, SCI's explanations for why it used EVA in the HDI product do not relate to the creation of more pores or voids, but for another purpose altogether which thereby appears to support Dr. Macosko's conclusion, namely, that the HDI product uses EVA "as a toughening agent to make it easier to produce the product and to make it more flexible and overcome the brittleness that would otherwise exist with 50% of molecular sieve particles." SCI's Trial Brief at 11. Neither SCI nor its experts has explained how making the product more flexible and less brittle dramatically increases the presence of cracks, pores, and voids. Indeed, common sense suggests the opposite result.

As a final point here, the MVTR data relating to compositions of polypropylene, PVOH (polyvinyl alcohol) and molecular sieve also undermine the pore theory. It was shown that by adding 10% PVOH to a composition of molecular sieve and polypropylene, the MVTR increased by a factor of forty-six, which result CSP and Dr. Macosko explained was consistent with the MVTR of a system in which PVOH functions as a channeling agent; (PVOH is a more effective moisture transmitter than EVA). D619. Under SCI's theory, however, one would have to expect

that the introduction of the PVOH would necessarily cause a dramatic increase in the number of cracks, pores, and voids present in the composition (as well as cause those cracks, pores, and voids to create interconnected pathways across the interior of the composition). SCI's evidence stopped short of providing a plausible explanation for the way in which the introduction of PVOH would cause such a remarkable crack, pore, or void formation.

The results of these tests yield two possible explanations: (1) Dr. Paul's theory about porosity is incorrect, or (2) any cracks, pores, or voids that form occur only on the surface of the composition without any interconnected pathways into or throughout the interior of composition.[39] We need not decide between these options, however, because ultimately either is fatal to SCI's pore theory. Accordingly, we hold that SCI's theories regarding the presence of pores in its HDI product as a distinguishing characteristic that differentiates it from CSP patented technology incorporating channels lack factual substantiation and legal merit.

II. Infringement.

CSP asserts that SCI's offer to sell its HDI Product infringed claims 1, 4, 7 and 25 of the '937 patent as well as claims 1 and 6 of the '255 patent. SCI rejoins that CSP has not presented evidence that the HDI product meets all of the limitations of the asserted claims.

CSP must prove its claim of infringement against SCI by a preponderance of the

[39] Even if pores are shown to exist in the HDI product, lacking any evidence that they form interconnected pathways through the interior of the composition removes any need for the Court to analyze the various SEM, TEM, and AFM experiments and images (and to attempt to resolve the related disputes including whether glass or diamond knives are better suited for preparing samples). Moreover, because the evidence strongly suggests that it is through the solid channel structure of the HDI product that moisture is transmitted throughout the composition, the mere presence of pores, cracks, or voids, which may or may not be present in the channeling agent, does not remove the HDI product from the scope of the CSP patent claims, as defined by this court.

evidence. "An infringement analysis is a two-step process in which the court first determines, as a matter of law, the correct claim scope, and then compares the properly construed claim to the accused device to determine, as a matter of fact, whether all of the claim limitations are present in the accused device, either literally or by a substantial equivalent." K-2 Corp. v. Salomon S.A., 191 F.3d 1356, 1362 (Fed. Cir. 1999). The burden of proving infringement rests on the patentee. Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc., 289 F.3d 801, 812 (Fed. Cir. 2002).

Since CSP did not attempt to prove infringement under the doctrine of equivalents, we need decide only whether literal infringement occurred. "Literal infringement requires the patentee to prove that the accused device contains each limitation of the asserted claim." Id. "A claim for patent infringement must be proven by a preponderance of the evidence, which simply requires proving that infringement was more likely than not to have occurred." Warner-Lambert Co. v. Teva Pharmaceuticals USA, Inc., 418 F.3d 1326, 1341 (Cir. Fed. 2005). To the extent that the accused product does not infringe an independent claim, it cannot, as a matter of law, infringe any of the dependent claims. See Wolverine World Wide, Inc. v. Nike, Inc., 38 F.3d 1192, 1199 (Fed. Cir. 1994); London v. Carson Pirie Scott & Co., 946 F.2d 1534, 1539 (Fed. Cir. 1991).

We have previously determined the proper scope of the claims in the Claim Construction Entry of March 14, 2005; therefore, the task remaining before the Court is to conduct a comparison between the asserted claims of the CSP patents and the HDI product manufactured by SCI.

Our review causes us to conclude that SCI's infringement defense is inherently self-defeating, because, instead of providing any affirmative evidence about the nature of the HDI

product,[40] SCI's infringement defense is little more than a series of unconnected, sometimes contradictory, counter-arguments, critiques, and hypothetical scenarios raised to challenge the research conducted by, as well as, and evidence presented by CSP. The evidence at trial makes clear that both parties actually agree that the HDI product infringes the CSP patents. Obviously, CSP and its experts believe that the HDI product infringes the CSP patents. But trial testimony and exhibits also reveal that, through internal communications between SCI and its attorneys, SCI also concluded that the HDI product infringes the CSP patents. SCI has requested that the court disregard this shared belief by the parties that the HDI product infringes and focus instead on conclusions from recent scientific experimentation conducted by the parties' experts in service of their respective litigation theories. For example, SCI's expert, Dr. Paul, openly admitted that he was hired to serve as "devil's advocate" to raise questions and doubts about CSP's evidence, rather than to opine on the nature of the HDI product.[41] We view this strategy as self-defeating, because, assuming *arguendo* we were to fully credit all of SCI's challenges to CSP's experimental evidence, we would nonetheless be left with the unrebutted presumption of infringement created by the fact that both parties in this litigation believe that the HDI product infringes the CSP patents.

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[40] We are assuming that SCI has dropped its "layered" product defense since the theory was not advanced in its briefs nor supported by the testimony of its expert, Dr. Paul.

[41] The role of Dr. Paul was best summarized by this exchange with SCI's lawyers:

> Q Now, in this case, did we -- I mean, the lawyers for SCI, did we ask you for an opinion that the HDI product does not contain channels or did we ask you for an opinion that CSP's evidence does not prove channels exist?
>
> A The latter.

Tr. 928:11-15.

A. The Evidence at Trial Establishes the HDI Product Infringes CSP's Patents.

CSP contends that the evidence adduced at trial clearly demonstrates that the HDI product possesses the claimed channel technology and thus infringes the asserted claims of the CSP patents. In response, SCI raises four principle defenses to literal infringement: (a) CSP has not proven the HDI Product has channels, (b) CSP has not proven that the HDI product contains at least 50% by volume of polymer base, (c) CSP has not proven that the HDI product satisfies the preferential affinity limitation, and (d) CSP has not proven the HDI product was created by application of the '937 Patent process. We conclude that none of these defenses has merit.

1. The Evidence Introduced at Trial Establishes that the HDI Product Has Channels.

SCI mistakenly asserts that CSP was required to introduce direct evidence to prove that the HDI product has channels and that the experimental results introduced by CSP are more accurately explained as showing the presence of cracks, pores, or voids, rather than channels. Neither of SCI's contentions in this regard is accurate. First, there is no requirement that CSP adduce only direct evidence on this point. As the Federal Circuit recently explained:

> A patentee may prove direct infringement . . . by either direct or circumstantial evidence. Moleculon Research Corp. v. CBS, Inc., 793 F.2d 1261, 1272 (Fed. Cir. 1986). There is no requirement that direct evidence be introduced, nor is a [factfinder's] preference for circumstantial evidence over direct evidence unreasonable per se. See Fuji Photo Film Co. v. Jazz Photo Corp., 394 F.3d 1368, 1374 (Fed. Cir. 2005); Moleculon Research, 793 F.2d at 1272 (noting "it is hornbook law that direct evidence of a fact is not necessary"); see also Michalic v. Cleveland Tankers, Inc., 364 U.S. 325, 330 (1960) ("Circumstantial evidence is not only sufficient, but may also be more certain, satisfying and persuasive than direct evidence.").

Liquid Dynamics Corp. v. Vaughan Co., Inc., 449 F.3d 1209, 1219 (Cir. Fed. 2006). In addition, as explained above, we view SCI's cracks, pores, and voids theory as lacking evidentiary

support. As a result, SCI's two primary arguments regarding its claim that the HDI product does not have channels are unavailing.

Because SCI has presented no credible evidence to the contrary, the only remaining issue necessitating a ruling here is whether CSP presented evidence that the HDI product more likely than not contains channels. The record is replete with evidence on this point. As explained above, see Factual Background Section IV(H)(2) and Legal Analysis Section I, supra, Dr. Macosko performed moisture vapor transmission rate ("MVTR") experiments on compositions containing polyethylene, molecular sieve, and EVA. The composition containing all three components was designed to replicate the HDI formulation. Dr. Macosko found that the MVTR dramatically increased when the EVA was added (the HDI formulation) as compared to the control sample without the EVA. D566b; D503; Tr. 365-73. Dr. Macosko viewed this significant increase in MVTR as convincing evidence of a channel morphology existing in the HDI Product. Tr. 366-371, 391-392.

SCI's attacks on the validity of some of Dr. Macosko's MVTR results undermine the conclusion that the HDI product contains channels. SCI's criticisms of Dr. Macosko's experimental procedure based on his use of samples with and without EVA and made according to differing procedures are well taken. SCI argues convincingly that the method of preparation can significantly impact the properties of a sample and, therefore, that Dr. Macosko's conclusions are therefore unreliable. Although this apparently sloppy sample preparation undermines Dr. Macosko's conclusions to a certain extent, we find much more reliable the MVTR data he generated from experiments using PVOH as a channeling agent utilizing samples prepared in the same manner but producing results consistent with Dr. Macosko's MVTR data for the HDI product. D619. Dr. Macosko also reliably applied a permeability model to his

MVTR results, which indicated that the HDI Product contains a channel morphology. D566b; Tr. 368-75. Dr. Paul contends that the significant increase in MVTR in Dr. Macosko's results was likely due to the fact that EVA is more hydrophilic (transmitting moisture more rapidly) than polyethylene and therefore necessarily increases the MVTR. Dr. Paul's theory, however, does not take into account the significant increase in MVTR when the three components – polymer base, channeling agent, and desiccant – are combined, as they are in the HDI Product.[42,43]

Regardless of the reliability of the MVTR test results, Dr. Macosko's hydrolysis test establishes that the HDI Product contains channels. Specifically, in conducting the hydrolysis test, Dr. Macosko converted all of the EVA channeling agent in the HDI Product formulation to EVOH (Tr. 376-77; D522; D197), explaining that the only way the hydrolysis could reach all of the EVA in the HDI Product would be through a channel structure connecting all the EVA. Id. SCI's criticisms on Dr. Macosko's hydrolysis procedure do not erode the reliability of his conclusion that the HDI product contains channels.[44]

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[42] Adding 16% EVA to polyethylene without desiccant only nominally increases the MVTR by .1 g mm/m2/day. Adding 8% EVA to polyethylene and molecular sieve to create the HDI Product, however, significantly increases the MVTR by 1.6 g mm/m2/day. D566b; Tr. 365:21-373:18; see also D619 (showing a significant increase in MVTR with the addition of 10% PVOH channeling agent); Tr. 373:19-375:5.

[43] SCI argues that CSP should be held to a standard which SCI asserts that CSP presented to the European Patent Office. See SCI's Trial Brief at 5-6. However, SCI's claim is based on its argumentative "cherry-picking" of non-analogous test results excerpted from CSP's European patent application in an effort to apply them to the present case. We agree with Dr. Macosko's assessment of SCI's action, as stated at trial: "It's like comparing apples and oranges, something that's very different." Tr. 498.

[44] In addition to its unfounded "pore" theory, SCI argues that Dr. Macosko's procedures were "carried out under extremely harsh conditions." SCI's Post-Trial Brief at 10. However, no evidence was adduced to indicate that Dr. Macosko's procedures were unusually harsh or that

SCI's final argument based on a theory advanced by Dr. Paul is that there is not enough EVA in the HDI product to coat all of the desiccant and form thick enough channels to effectively transmit moisture. This theory, however, is inconsistent with the evidence introduced at trial. As noted above, Dr. Paul's "theory" was thoroughly and convincingly contradicted by Dr. Macosko's MVTR and hydrolysis data which revealed that 8% EVA is sufficient to form channels in the HDI Product. See D519; D520; D566b; D522; Tr. 361-404. In addition, Dr. Fredrickson's experiments showed that different systems with 5% and 10% channeling agent were sufficient to form channels. See D41; Tr. 239-41; D39; D40; Tr. 250-54. Dr. Fredrickson also demonstrated the weakness of Dr. Paul's theory which failed to take into proper account the role of the base polymer. See Tr. 260-62; D533. Moreover, Dr. Paul's own testimony undermined the "insufficient amounts of EVA" theory, when,/ in cross-examination, he admitted that there was enough EVA present to form a coating of .15 microns around the desiccant particles, which would be approximately one thousand times larger than a water molecule. Tr. 870-871. Dr. Paul further conceded that multiple water molecules could permeate simultaneously such a thin strip coating. Id. Thus, even crediting the testimony Dr. Paul, we find that there is enough EVA present in the HDI product to coat the molecular sieve and transmit water molecules.

Based on the testimony regarding the experimental results from Dr. Macosko, we conclude that CSP has proven that the HDI product contains channels.[45]

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they unduly affected the results of his experiments. If it had wished to pursue this line of argument, SCI had sufficient opportunity to do so prior to the passing mention of it in its post-trial briefing.

[45] We have omitted from our analysis any consideration of the moisture uptake tests performed by Dr. Macosko. During his testimony Dr. Macosko could not explain why the 8%

2. The Evidence Establishes that the HDI Product Has "At Least About 50%" by Volume of Polymer Base.

SCI contends that the evidence adduced at trial indicates the HDI product is not "at least about 50%" by volume of polymer base. On this, however, SCI is mistaken. While SCI's expert, Dr. Paul, refused to answer this specific question, other evidence introduced at trial revealed that the HDI product consists of "at least about 50%" polymer base.

The HDI product must contain "at least about 50%" of polymer base, pursuant to Claims 1 and 6 of the '255 patent (providing that "the volume fraction of component A [the polymer base] represents at least about 50% by volume of the total volume of components A, B and C"). It is undisputed that the HDI Product includes 42% by weight polyethylene, the polymer base component, but this number must be converted to a volume percent. Tr. 125. Using measured densities of the materials in the sample HDI Product prepared by CSP, Dr. Macosko calculated that the HDI Product contained 50.237% by volume polyethylene. D534; Tr. 396. Normally, Dr. Macosko testified, he would calculate density using the manufacturer's density information. Tr. 477-78. Dr. Paul, in fact, did rely on the manufacturer's density information, as obtained for him by SCI's attorneys, to calculate that the polyethylene was 45.6% by volume of the HDI Product. When asked at trial whether 45.6% was "about 50%" in the context of the CSP patents, Dr. Paul

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EVA sample had a lower capacity than the 4% EVA and 0% EVA samples and stated he believed there was something wrong with the 8% EVA sample and that even he could not trust the data. See Tr. 458-61, 496. Based on the trial testimony, adding EVA to a sample of molecular sieve and polyethylene should increase the sample's capacity. Thus, like Dr. Macosko, we are at a loss to understand why the 8% EVA sample had such a reduced capacity. On the other hand, Dr. Paul unconvincingly concluded, without explanation, that adding 4% EVA increased the sample's capacity while adding 8% "noticeably" decreased the capacity of the sample. Tr. 762-63. Without some plausible scientific explanation to explain his otherwise wholly unexpected and counter-intuitive conclusion, we can not accept Dr. Paul's testimony on this matter. As a result, we believe the most reasonable explanation for the data in Dr. Macosko's moisture uptake test is that the 8% EVA sample simply was not reliable.

did not reply. Tr. 907-909.[46] Dr. Macosko testified that, in the context of the CSP patents, 46% is "at least about 50%." Thus, regardless of whose calculations we adopt, the undisputed evidence established that the HDI product contains "at least about 50%" polymer base.

3. The Evidence Establishes that the EVA in the HDI Product Has A Preferential Affinity for the Molecular Sieve.

SCI has erroneously asserted that CSP must present direct evidence that EVA has a preferential affinity for molecular sieve and that more than 50% of the molecular sieve resides within the EVA in the HDI product, pursuant to Claim 1 of the '255 patent and Claim 7 of the '937 patent.[47] SCI does, however, correctly report that the plain language of these claims requires more than 50% of the desiccant to reside in the channeling agent, rather than in the polymer base. See Moore U.S.A., Inc. v. Standard Register Co., 229 F.3d 1091, 1106 (Fed. Cir. 2000) (stating: "it would defy logic to conclude that a minority–the very antithesis of a majority–could be insubstantially different from a claim limitation requiring a majority, and no reasonable juror could find otherwise"). SCI maintains, and we agree, that these claims require two separate showings: First, that the channeling agent has a preferential affinity for the desiccant and, second, that more than 50% of the desiccant resides in the channeling agent. SCI

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[46] We note, however, at his deposition, Dr. Paul clearly testified that 47% was "about 50%" when he was asked this question in the context of the Lancesseur patent. Tr. 908. Dr. Paul's reluctance to answer the virtually identical question at trial, in the context of the CSP patents, was one of many examples of his evasiveness or outright refusal to answer questions directly which he surmised would negatively impact SCI's position in this litigation. Dr. Paul's obfuscations have reduced the reliability and credibility of his expert testimony.

[47] Claim 1 of the '255 patent limitation (f) requires a preferential affinity between the channeling agent and the desiccant and limitation (g) requires at least two aggregates, one composed of a majority of the polymer base and the other composed of a majority of the channeling agent and a majority of the desiccating agent. Similarly, Claim 7 of the '937 patent, requires that "a greater concentration of desiccating agent . . . form in the channeling agent than in the polymer."

contends that CSP has failed to satisfy either of these two requirements "[b]ecause CSP's experts relied on no direct evidence of the preferential affinity limitations." SCI's insistence that CSP present direct evidence, however, is legally erroneous; as explained above, CSP is not required under any applicable precedent or other rule of law to rely on only direct evidence to prove infringement. See Liquid Dynamics Corp. v. Vaughan Co., Inc., 449 F.3d 1209, 1219 (Cir. Fed. 2006).

SCI's required direct evidence standard appears to be another of its frequent obfuscations, particularly in view of the fact that the evidence at trial revealed no real dispute among the various experts concerning the fact that EVA has a preferential affinity for molecular sieve and that a majority of the molecular sieve would therefore be expected to reside within the EVA. SCI's expert, Dr. Paul, agreed that EVA is more polar than is polyethylene and that, in the HDI product, it is thus more likely that desiccant resides in the EVA than in the polyethylene (although once again Dr. Paul admitted this only "after a lot of qualifications"). Tr. 909. Another of SCI's witnesses, Mr. Dessus, testified that EVA has a higher permeability to water than polyethylene, has a higher MVTR than polyethylene, is more polar than polyethylene, and has a greater attraction to molecular seive than polyethylene. Tr. 162-63. Based on the testimony of SCI's own witnesses, there is sufficient circumstantial evidence to establish that the HDI product meets both of the preferential affinity limitations contained in the CSP patents.

4. SCI's Belated Assertion that the HDI Product Was Not Made by Applying the '937 Process Is Both Untimely and Improper.

SCI has raised for the first time in its Post-Trial Reply Brief the claim that CSP has not proven that the HDI Product was made from the process described in the'937 patent. Although it is unclear which particular steps of the '937 patent SCI belatedly maintains were not followed

in the manufacture of the HDI product, SCI appears, at the very least, to contend that the '937 patent requires that the desiccant first be mixed into the polymer and thereafter the channeling agent is added.[48] SCI cites Joint Stipulated Facts 8 and 9 in support of its contention that the HDI product involves a production process that entails first mixing the polymer base and channeling agent and then adding the desiccant.[49]

SCI's failure to develop this issue prior to its post-trial briefs dooms it from consideration by the Court. At the *Markman* hearing, with respect to Claim 1 of the '937 patent, the parties' evidence and arguments were directed at interpreting only the words "channeling agent" and "passages." As a result, the Court did not address whether the blending steps recited in Claim 1 must be completed in a particular sequence.[50] Our review of the record created subsequently to

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[48] Claim 1, of the '937 patent, recites:

> A process for producing a moisture absorbing desiccant entrained polymer, said process comprising:
>
> causing a polymer to assume a molten state, said polymer acting as a moisture barrier in a solidified state;
>
> blending a desiccating agent into the polymer so that the desiccating agent is distributed within the polymer;
>
> blending a channeling agent into the polymer so that the channeling agent is distributed within the polymer thereby creating a blended mixture; and
>
> solidifying the mixture so that the channeling agent forms passages in the mixture through which moisture is communicable to desiccating agent entrained within the mixture.

[49] Joint Stipulated Fact 8 provides: "The HDI Product was produced by a process that included the following step: blending Molecular Sieve into a polymer blend so that the Molecular Sieve is distributed within the polymer blend." While Joint Stipulated Fact 9 provides: "The HDI Product was produced by a process that included the following step: blending EVA into a polymer so that the EVA is distributed within the polymer thereby creating a polymer blend." Arguably, the process described in Fact 9 must precede the process described in Fact 8.

[50] We note, however, that in the Factual Background section of the Court's Entry on Claim Construction the Court combined the two blending steps described in Claim 1 of the '937

the *Markman* hearing reveals that SCI failed to raise the sequence of steps for blending as an issue or defense in any of its various motions for summary judgment or other pre-trial motions. Our review of the record indicates that SCI intentionally disclosed the substance of this defense for the first time in its *Post-Trial Reply Brief*, thereby allowing CSP no opportunity to respond.[51]

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patent into a single undifferentiated step which described the claimed process as follows:

> The claimed process for producing a desiccant entrained polymer consists of the following steps: (1) a polymer base is melted; (2) *while in a molten state, two materials - a desiccating agent and a channeling agent - are added, blended and mixed together thoroughly;* (3) the blended mixture is solidified; and (4) the channeling agent separates from the polymer base and forms solidified pathways or channels throughout the polymer. '937 patent, col 18, ll. 39-52.

Court's March 14, 2005, Entry on Claim Construction at 3 (emphasis added).

[51] Although initially raised in the Post-Trial Brief, SCI's treatment of this issue prior to its Post-Trial Reply Brief was limited to the following paragraph:

> All of the asserted claims in the '937 patent are process claims. Since the accused HDI product was manufactured outside the United States by Airsec, a company affiliated with SCI, CSP relies on 35 U.S.C. § 271(g), which requires proof that the accused product was made by a process patented in the United States, namely the process of the asserted claims of the '937 patent. But CSP has introduced no evidence of how Airsec made the accused HDI product. Instead, Dr. Macosko described only how he or CSP made the HDI formulation. FF 98. Consequently, CSP has failed to prove infringement of any of the asserted claims of the '937 patent.

SCI's Post-Trial Brief at 13. The second-to-last sentence is contrary to the parties' joint stipulation covering at least part of the process by which the HDI product was made. See Joint Stipulations of Fact 8, 9. In addition, Mr. Dessus testified that the HDI product that was offered for sale was actually made at Multibase, not Airsec, and he further testified as to the methodology by which the HDI product was manufactured at Multibase. Tr. 169-70. In its Post-Trial Reply Brief, SCI (correctly as it turned out) anticipated that CSP would rely on Joint Stipulated Facts 8 and 9 and thus, for the first time in this litigation, explained the basis of SCI's belief that these stipulated facts do not satisfy the limitations in Claim 1 of the '937 patent. SCI's Post-Trial Reply Brief at 11. By delaying until the Post-Trial Reply Brief, SCI effectively ensured that this defense would not succeed.

Following well-established precedent, this attempt at trial by ambush can not succeed. See, e.g., Dunne v. Libbra, 448 F.3d 1024, 1030 (8th Cir. 2006) (affirming district court's denial, as trial by ambush, of a claim which had not been asserted until the trial record was closed); Southern Wabash Communications, Ltd. v. Union County Braodcasting Co., Inc., 69 Fed. Appx. 285, 292 (6th Cir. 2003) (noting that modern federal discovery rules were designed to prevent trial by ambush); Brandon v. Mare-Bear, Inc., 2000 WL 732926, *4 (9th Cir. 2000) (unpublished) (explaining one of the principal goals of the discovery rules is to prevent "trial by ambush and surprise") (citing Maurice Rosenberg, Federal Rules of Civil Procedure in Action: Assessing Their Impact, 137 U. Pa. L.Rev. 2197, 2197-98 (1989)); Rodriguez v. Doral Mortg. Corp., 57 F.3d 1168, 1172 (1st Cir. 1995) ("The truth-seeking function of our adversarial system of justice is disserved when the boundaries of a suit remain ill-defined and litigants are exposed to the vicissitudes of trial by ambush."); Woods v. International Harvester Co., 697 F.2d 635, 639 (5th Cir. 1983) ("[T]rial by ambush is not contemplated by the Federal Rules of Civil Procedure"). Further compounding the problem of its dilatoriness in raising this issue, SCI has provided no citations to the record and no legal authorities to support its interpretation of Claim 1 of the '937. Assuming *arguendo* that we chose to address the merits of this late-breaking defense, SCI's failure to provide the necessary factual and legal basis with which to do so renders it meritless.

Accordingly, we decline to address as untimely SCI's asserted defense that the HDI product was not produced by the process described in the '937 patent and overrule it. **B.**

It is More Likely Than Not the HDI Product Infringes the CSP Patents.

CSP needs to prove that "that infringement was more likely than not to have occurred." Warner-Lambert Co. v. Teva Pharmaceuticals USA, Inc., 418 F.3d 1326, 1341 (Cir. Fed. 2005). For all the above-mentioned reasons, we hold on the basis of the evidence adduced at trial that

the HDI product more likely than not infringes the CSP patents.

II. VALIDITY

SCI has also challenged the validity of the CSP patents on the following grounds: the patent claims are not enabled, the patents contain an inadequate written description, the patents are anticipated by Lancesseur, the patents are obvious in light of Lancesseur, and the '255 patent is barred by a prior sale more than one year before its priority date. CSP denies all these assertions of invalidity, maintaining that both of its patents are valid.

The CSP patents are presumed to be valid, requiring SCI to prove invalidity by clear and convincing evidence. As the Federal Circuit has ruled: "The patent statute, 35 U.S.C. § 282, is unambiguous: 'A patent shall be presumed valid ··· [T]he burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.' " Roper Corp. v. Litton Systems, Inc., 757 F.2d 1266, 1270 (Fed. Cir. 1985). The presumption of validity "is based in part on the expertise of patent examiners presumed to have done their job." Brooktree Corp. v. Advanced Micro Devices, Inc., 977 F.2d 1555, 1574 (Fed. Cir. 1992) (citations omitted).

A party challenging the validity of a patent, here SCI, "has the burden of showing invalidity by clear and convincing evidence." Glaxo Group Ltd. v. Apotex, Inc., 376 F.3d 1339, 1348 (Fed. Cir. 2004); 35 U.S.C. § 282. Clear and convincing evidence is evidence that places "in the ultimate factfinder an abiding conviction that the truth of [the relevant] factual contentions are highly probable." Colorado v. New Mexico, 467 U.S. 310, 316 (1984). The burden of showing invalidity by clear and convincing evidence "is 'especially difficult' when, as is the present case, the infringer attempts to rely on prior art that was before the patent examiner during prosecution." Glaxo Group, 376 F.3d at 1348.

Because our analysis of the issues of enablement, the written description, anticipation, and obviousness all must be made from the perspective of one skilled in the art, we return to the issue of who, in the circumstances presented by these patents, is a person of ordinary skill in the art.

A. Level of Ordinary Skill in the Art.

The Federal Circuit has explained: "The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in [a validity analysis]." Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 718 (Fed. Cir. 1991). The level of ordinary skill in the art is a factual question the Court must resolve so as to ascertain what would have been objectively known or obvious to one of ordinary skill in the art at the time of invention (as opposed to relying on what was subjectively known or obvious to the inventor at such a time). Id. SCI contends that a person of ordinary skill in the art in understanding and applying these patents is someone with a "bachelor's degree in chemical engineering, polymer science, or chemistry, and five years of experience in the field of manufacturing plastic articles." SCI's Trial Brief at 15-16. CSP contends in contrast, that a person of ordinary skill in the art is a person with a "Ph.D. degree in chemistry, physics, chemical engineering, materials science, or polymer science, and at least five years of industrial experience in the design of multiphase polymer alloys." DTX 551.

In determining the level of ordinary skill in the art, the Federal Circuit instructs district court judges to consider the following: "(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field." Environmental Designs, Ltd. v. Union Oil Co. of California, 713 F.2d

693, 696-97 (Fed. Cir. 1983), (citing Orthopedic Equipment Co., Inc. v. All Orthopedic Appliances, Inc., 707 F.2d 1376 at 1381-1382 (Fed. Cir. 1983)). As the Federal Circuit has further explained: "A person of ordinary skill in the art is also presumed to be one who thinks along the line of conventional wisdom in the art and is not one who undertakes to innovate, whether by patient, and often expensive, systematic research or by extraordinary insights, it makes no difference which." Standard Oil Co. v. American Cyanamid Co., 774 F.2d 448, 454 (Fed. Cir. 1985).

There is a wide disparity between the respective definitions of persons of ordinary skill in the art as advanced by the parties. However, in applying the salient factors identified by the Federal Circuit, we conclude that the proper level of skill in this case is a Ph.D.-level scientist. In support of that conclusion, we note that: (1) Dr. Hekal, the inventor of the CSP patents, is a Ph.D.-level scientist and it was he who was specifically sought out by CSP to conduct this research and development based on his education and experience when CSP needed to resolve the problems ultimately encompassed by the CSP patents. (2) After the Hekal invention, Dr. Fredrickson, also a Ph.D.-level scientist, conducted substantial research related to the CSP patents and published at least three articles based on the technology involved. (3) The trial testimony established that Ph.D.-level scientists must typically resolve the types of problems encountered with channel morphologies. (4) The trial testimony also revealed that it is Ph.D.-level scientists who design multi-polymer compositions with channel morphologies of the type described in the CSP patents, and who, in turn, guide lower-skilled employees in carrying out the solutions. (5) Dr. Fredrickson testified that, based on his knowledge of the field, the technology described in the CSP patents had not been contained in the scientific literature prior to the patent's issuance. These factors all clearly indicate that the CSP patents involve issues and

concepts that, both prior and subsequent to the issuance of the CSP patents, have been the province of Ph.D.-level scientists. In addition, SCI's own trial preparations confirm that the proper level of skill for an ordinary person in the art is a Ph.D.-level scientist, specifically, by its own reliance on Dr. Paul as SCI's technical expert, a Ph.D.-level scientist, whose report was typed up by a lawyer also holding a Ph.D. degree; these two individuals, acting together, chose, directed, and interpreted the results of SCI's experiments.

We reach the conclusion that the person of ordinary skill in the art in this context is a Ph.D.-level scientist mindful of our prior holding in another, unrelated case, that "the level of ordinary skill in the art . . . is not determined by reference to 'geniuses in the art. ' " Endress + Hauser, Inc. v. Hawk Measurement Systems Pty. Ltd., 892 F. Supp. 1107, 1120 (S.D. Ind. 1995) (citing Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc., 807 F.2d 955, 962 (Fed. Cir. 1986); Environmental Designs, Ltd. v. Union Oil Co of California, 713 F.2d 693, 697 (Fed. Cir. 1983)). Had SCI advanced a more workable definition of ordinary skill in the art, we might have been persuaded to adopt it. SCI, however, argued in favor of a level of ordinary skill that is plainly too low to be feasible, maintaining that the individuals working at both CSP and SCI should all have technical degrees and some experience, but not Ph.D.s. The evidence does not support SCI's view that these non-doctoral employees are the ones responsible for designing and developing products with channel morphologies. While such individuals certainly could be entrusted to produce polymer blend compositions with channel morphology according to an established recipe, the recipe itself would mostly likely have to have been developed by someone with exceedingly high expertise, such as a Ph.D.-level scientist, and with demonstrably more knowledge and skill. We hold, therefore, that a Ph.D.-level scientist is the appropriate definition for the level of one of ordinary skill in the art. We turn now to the specific grounds for invalidity

asserted by SCI.

B. Statutory Requirement of Enablement.

The objectives of 35 U.S.C. § 112, which requires that a patent application disclose the invention, "are that others may construct and use the invention after the expiration of the patent and that the public be informed during the life of the patent of the limits of the monopoly asserted so that the public may know which features may be safely used or manufactured without a license and which may not." Schriber-Schroth Co. v. Cleveland Trust Co., 305 U.S. 47, 57 (1938). Enablement is the name given to the first requirement, i.e., that a patent application disclosure allow others to construct and use the invention after the expiration of the patent. To this end, a patent application must contain a specification section, which, pursuant to 35 U.S.C. § 112, provides:

> shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The Federal Circuit has explained that "[i]n order to enable the claims of a patent pursuant to § 112, the patent specification must teach those of ordinary skill in the art 'how to make and use the full scope of the claimed invention without undue experimentation.' " Liquid Dynamics Corp. v. Vaughan Co., Inc., 449 F.3d 1209, 1224 (Fed. Cir. 2006) (quoting Bruning v. Hirose, 161 F.3d 681, 686 (Fed. Cir. 1998)). Although some experiment by a person or ordinary skill may be necessary to carry out the invention, the experimentation "cannot be unduly excessive." Id. (citing Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1384 (Fed. Cir. 1986)). The Court's analysis should necessarily focus on the information conveyed by the patent

to one of "ordinary skill in the art-not to the judge, or to a layman, or to those skilled in remote arts, or to geniuses in the art at hand." Environmental Designs, Ltd. v. Union Oil Co. of California, 713 F.2d 693, 696-97 (Fed. Cir. 1983).

Whether a written description enables a person of ordinary skill is a question of law, but it is based on factual findings. Id. (citing Bruning, 161 F.3d at 686).

SCI maintains that a person skilled in the art would not be able to carry out the claimed invention without undue experimentation. CSP responds that the evidence at trial established that the only persons skilled in the art who attempted to carry out the claimed invention were able to do so.

1. The CSP Patents Are Enabling

The evidence at trial demonstrates that the CSP patents provide enough disclosure to enable one skilled in the art to carry out the claimed inventions. In its Post-Trial Brief, CSP accurately described the disclosure of the patents at issue, as follows:

> The evidence at trial showed that the patents-in-suit teach the use of a channeling agent that forms channels to quickly transmit moisture to the desiccant entrained inside a moisture barrier polymer. Tr. 94-103, 202-239, 416-418; D38-D41; D204; D619. The patents-in-suit teach that the channeling agent should transmit moisture faster than the moisture barrier polymer base, should have an affinity for the desiccating agent and should phase separate from the polymer base. D1 col. 8, lns. 15-35; D3. The patents-in-suit also teach that the preferred amount of desiccating agent is approximately 45-60% by weight and that the preferred amount of polymer is about 40% by weight. D1 col. 8, lns. 49-57; D3.

CSP's Post-Trial Brief at 44. Based on this disclosure, the evidence established that only two persons of ordinary skill in the art, Dr. Fredrickson and Dr. Macosko, attempted to carry out the claimed invention and were able to do so in accordance with the disclosure in the CSP patents without undue experimentation.

In carrying out the claimed invention, Dr. Fredrickson's early experiments revealed several limitations of the claimed technology, including: that the channeling agent should have a preferential affinity based on more than just polarity, that one needs a minimum of at least 30% to 40% by volume of desiccant particles in order to achieve channels, and that minimum amounts of channeling agent are necessary to form channels. Dr. Fredrickson testified that undue experimentation was not required to carry out the invention or to discover these limitations. Moreover, these experiments were conducted by Dr. Fredrickson several years prior to this litigation in an entirely unrelated context. Surprisingly, SCI has argued that the limitations discovered by Dr. Fredrickson are not disclosed in the CSP patents and cannot be discovered by one skilled in the art except through undue experimentation. The sole basis for SCI's contention appears to be the unsupported speculations of Dr. Paul, who did not conduct any experiments himself. These speculations of Dr. Paul and of SCI's attorneys do not constitute sufficient grounds, much less clear and convincing evidence, on which to discount the otherwise credible testimony of Dr. Fredrickson. Accordingly, we conclude with little difficulty that the CSP patents enable one skilled in the art to carry out the claimed inventions without undue experimentation.[52]

2. The CSP Patents Do Not Require Undue Experimentation.

Ignoring the fact that the CSP patents enabled Dr. Fredrickson to carry out the claimed invention, SCI argues that the CSP patents require undue experimentation because there are "no working examples or specific recipes to follow." SCI's Post-Trial Brief at 18. However, as the Federal Circuit has explained:

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[52] The only evidence SCI presents to the contrary were the untested speculations of Dr. Paul. See, e.g., Tr. 828:6-829:1; Tr. 921:8-25.

> A claim will not be invalidated on section 112 grounds simply because the embodiments of the specification do not contain examples explicitly covering the full scope of the claim language. See Union Oil Co. v. Atl. Richfield Co., 208 F.3d 989, 997 (Fed. Cir. 2000). That is because the patent specification is written for a person of skill in the art, and such a person comes to the patent with the knowledge of what has come before. In re GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995). Placed in that context, it is unnecessary to spell out every detail of the invention in the specification; only enough must be included to convince a person of skill in the art that the inventor possessed the invention and to enable such a person to make and use the invention without undue experimentation.

LizardTech, Inc. v. Earth Resource Mapping, Inc., 424 F.3d 1336, 1345 (Fed. Cir. 2005). As we have previously determined, the evidence at trial established that persons skilled in the art who wished to carry out the invention were able to do so without undue experimentation, notwithstanding the lack of examples or specific recipes. Accordingly, SCI's contention to the contrary is not persuasive.

3. One Skilled in the Art Would Understand that the CSP Patents Refer to Weight Percent of the Total Composition.

SCI further argues that the CSP patents are not enabling because the recommended amount of desiccant is not expressed in weight percent with respect to the entire combination, but instead is expressed in weight percent with respect to the polymer base.[53] The evidence at trial indicated, however, that a person of skill in the art would not be unduly confused by this admittedly inartful language. In particular, Dr. Fredrickson explained his response to this provision, as follows:

> I interpreted that particular line of approximately 60 percent by weight with respect to the polymer base as approximately 60 percent by weight with respect to the overall composition. It's certainly my experience that

[53] The '937 Patent states: "For that reason, it has been found to be advantageous to have a maximum desiccant load of approximately sixty percent by weight with respect to the polymer base." '937 Patent, Col 8, ln, 49-51.

> when you talk about weight percentages or volume percentages or mole percentages, you're always talking about a percentage of the overall composition. So I interpreted this as just kind of sloppy penmenship in terms of drafting that particular sentence.

Tr. 225-226. SCI's expert, Dr. Paul, agreed that "[u]sually a percentage refers to the total composition," D168 at 106; (we note, however, that Dr. Paul professed to be completely flummoxed by this language in the CSP patent). Once again, we view Dr. Fredrickson's testimony as credible and conclude that a person skilled in the art would not be confused by the cited language in the CSP patent.

4. A Person Skilled in the Art Would Understand the CSP Patents to Disclose Percentage Ranges for All Three Component Parts.

SCI's final argument is that the CSP patents are not enabling because they do not disclose percentage ranges for all three required components. SCI notes that "[t]he only disclosure regarding relative amounts in the '937 and '255 patent specification is found in the following passage, which appears in both patents:

> It has been found that the higher the desiccant concentration in the mixture, the greater the absorption capacity will be of the plastic structure created therefrom, however, that body will be more brittle and the mixture will be more difficult to either thermally form, extrude or injection mold. For that reason, it has been found to be advantageous to have a maximum desiccant load of approximately sixty percent by weight with respect to the polymer base. It is preferred to maintain the load within a forty-five to fifty percent range for optimum performance in certain applications such as those that require a rigid structure. Similarly, in the instance of polypropylene being used as the polymer base or phase, **its** content should be maintained at about forty percent by weight, or greater to assure its performance characteristics.

SCI's Post-Trial Brief at 19 (emphasis added). Essentially, SCI argues that this passage does not disclose the relative amounts of all three components because, throughout the course of this litigation, SCI and its expert became confused about the antecedent of the underlined and bolded

word, "its." SCI's confusion arises from whether the first "its" in the offending sentence refers to the polymer base or to the desiccant. Although initially, SCI (and its respective experts) agreed with CSP (and its respective experts) that the "its" in question refers to the polymer base, at some point, SCI decided that the first "its" actually referred to the desiccant.[54]

Certainly, the use of indefinite pronouns can create confusion in attempting to nail down their precise reference points. However, in this case, SCI's proffered interpretation conflicts with linguistic sense, scientific sense, and common sense. As best we can determine, there is no dispute between the parties concerning the meaning of the second "its," as in "its performance characteristics," as referring to the polymer base. But in advancing its admittedly novel interpretation of the word "its," SCI assigns two differing antecedents to the same pronoun in the same sentence (without any support for that interpretation in the sentence itself). Moreover, SCI's interpretation of the subject phrase does not make scientific sense. The focus of the passage in question is on maintaining the structural integrity of the polymer base while allowing for the maximum possible desiccant load. As the passage provides, increases in the relative percentage of desiccant adversely impacts the performance characteristics of the polymer base.[55]

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[54] The explanation of who is responsible for this change in interpretation and its timing has been "evolving," as this litigation has progressed. In its pre-trial briefings, SCI maintained that "in early September, 2005, SCI's expert on Patent and Trademark Office practice, Mr. Sherman Winters, discovered Dr. Fredrickson's erroneous interpretation of "its" when Mr. Winters was preparing for his expert deposition." See DTX 490 at 6. At trial, Dr. Paul testified that the novel reading of "its" was "my idea that I got from reading that deposition from Dr. Fredrickson. That is my interpretation and mine alone." Tr. 925. In his deposition, however, Dr. Paul stated he did not remember whether it was he who brought this interpretation to the attention of the lawyers, or if it was the lawyers who brought it to his attention. Paul Dep. at 42.

[55] We note that SCI agrees with this interpretation of the paragraph. See SCI's Trial Brief at 20 ("The topic sentence notes that maximizing the desiccant content will provide greater absorption capacity but will make the material more brittle and harder to process").

SCI's proffered interpretation reverses this teaching by suggesting the exact opposite: that a minimum threshold of desiccant is necessary to maintain the integrity of the polypropylene. SCI's interpretation, that by increasing the relative percentage of the desiccant load the performance characteristics of the polypropylene are somehow maintained, leaves us at a loss to understand how someone skilled in the art would understand SCI's proffered interpretation to be scientifically, never mind linguistically, reasonable.[56]

We conclude on all these grounds that the CSP patents meet the enablement requirements of 35 U.S.C. § 112.[57]

C. Statutory Requirements for the Written Description.

Pursuant to 35 U.S.C. § 112, a patent must contain "a written description of the invention." "The purpose of the written description requirement is to prevent an applicant from later asserting that he invented that which he did not; the applicant for a patent is therefore required to 'recount his invention in such detail that his future claims can be determined to be encompassed within his original creation.'" Amgen Inc. v. Hoechst Marion Roussel Inc., 314 F.3d 1313, 1330 (Fed. Cir. 2003). Satisfaction of the written description requirement is measured by the understanding of an ordinary person skilled in the art. Id. (citing Lockwood v.

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[56] We note in passing that relying on such an obviously implausible interpretation does not strengthen the merits of SCI's case. That SCI's expert adopted this same interpretation and that SCI vigorously opposed a Motion in Limine in an effort to ensure that this strained interpretation remained before the Court does not engender confidence in SCI's arguments generally. The conflicting stories presented by SCI, concerning, for example, who came up with this interpretation, casts doubt over many other aspects of its case.

[57] These rulings aside, we are convinced that CSP developed its new technology and reduced that technology to practice and filed its patent applications at a time when it did not fully understand all the limitations of its discovery. CSP patents are far from model disclosures. In addition, the CSP patents contain inartful language, which has unnecessarily complicated this litigation.

Am. Airlines, Inc., 107 F.3d 1565, 1572 (Fed. Cir. 1997)). "Compliance with the written description requirement is essentially a fact-based inquiry that will 'necessarily vary depending on the nature of the invention claimed.' " Id. (quoting Enzo Biochem v. Gen-Probe, Inc., 296 F.3d 1316, 1324 (Fed. Cir. 2002)). The enablement and the written description requirements "usually rise and fall together. That is, a recitation of how to make and use the invention across the full breadth of the claim is ordinarily sufficient to demonstrate that the inventor possesses the full scope of the invention, and vice versa." LizardTech, Inc. v. Earth Resource Mapping, Inc., 424 F.3d 1336, 1345 (Cir. Fed. 2005).

SCI asserts that the CSP patents' written description does not include percentage ranges for all three claimed components and that the asserted claims of the CSP patents are invalid due to a lack of support in the patents' written description. CSP maintains that one skilled in the art would be able to determine percentage ranges for all three components and would understand all the challenged claims to be supported by the patents' written description.

1. The CSP Patents Contain An Adequate Written Description.

SCI advances three challenges to the written description of the CSP patents, each of which fails for the same reasons their enablement challenges failed:

First, SCI contends: "There are no suggested percentage ranges for all three components, nor can such percentage ranges be deduced from the limited disclosure of suggested desiccant loads with respect to the polymer base in column." Trial Brief at 29. As we explain in Legal Analysis Section II(B)(3), supra, a person skilled in the art would not be confused by the "with respect to" phrase in the CSP patent, would understand the percentage ranges to reference the total composition and, therefore, would be able to calculate percentage ranges for all three compounds.

SCI's next challenge is to the limitation on Claim 6 of the '255 patent which provides that "the range of desiccating agent is between about 40% to about 60% by weight of the total composition" because the patent discloses "weight percents 'with respect to the polymer base.' " SCI's Trial Brief at 32. As explained in Legal Analysis Section II(B)(3), supra, a person skilled in the art would not be confused by the use of the phrase, "with respect to" in the CSP patent, understanding the percentage ranges to be referenced in terms of the total composition. However, under this reading of the patent, SCI argues that "there is no longer any teaching in the specification that the desiccant can be as low as 40%. Thus, . . . the specification describes a [preferred] range of only 45% to 60% desiccating agent, which fails to support the claimed range of 40% to 60%." SCI's Trial Brief at 32. The Federal Circuit guides our resolution of this challenge, having clarified in a recent decision that:

> "the ranges in applicant's claims need not correspond exactly to those disclosed in the parent application. Rather, this court clarified that the issue is whether one of skill in the art could derive the claimed ranges from the parent's disclosure. . . . The written description requirement does not require identical descriptions of claimed compounds, but it requires enough disclosure in the patent to show one of skill in this art that the inventor 'invented what is claimed.' "

Union Oil Co. of California v. Atlantic Richfield Co., 208 F.3d 989, 1001 (Fed. Cir. 2000) (internal citations omitted). Evidence at trial established that one skilled in the art would be unable to derive the 40% to 60% claim limitation from the preferred embodiment range of 45% to 60%.[58] Based on the patent's written description, Dr. Fredrickson discovered with no apparent difficulty that 30%-40% by volume of desiccant is necessary for channel formation.

[58] This evidence was largely, if not entirely, left uncontested by SCI's apparent failure to develop this defense either in their interrogatory answers or expert reports, see CSP Reply Brief at 13 (citing D215.005-006; D168.140-146), or during the trial testimony.

On this basis, we believe one skilled in the art would find that the written description supports the limitation of 40% to 60% by weight of desiccant.

SCI also asserts that there is no support for the '255 patent Claim 1 limitation (and, by extension, dependent claim 6) that the polymer be at least about 50% by volume of the entire composition because: "To convert weight percents to volume percents, one must know the density of each component in the composition." Trial Brief at 30. The '255 patent discloses that the polymer base material should be at least about 40% *by weight*, see Legal Analysis Section II(B)(4), supra, D3 col. 8, lns. 54-57; Tr. 263:4-7, and the testimony at trial showed that one of skill in the art can readily perform the conversion from weight to volume percent. Tr. 263, 295, 419; Hekal Dep. 190-196.27 Thus, we conclude that CSP was not required to include volume percentages in the patents or demonstrate weight to volume calculations. The evidence is less clear that the CSP patents support the "at least 50%" requirement. At trial, Dr. Paul testified that he could "imagine" using molecular sieve and an unidentified polymer base and unidentified channeling agent which would leave the volume percent of the polymer base at 43%. Tr. 837. However, also at trial, Drs. Fredrickson and Macosko provided examples of several actual compositions to demonstrate that the 40% by weight limitation could convert to an at least 50% by volume limatation. D617; Tr. 263:8-264:19, 418-419; P137. The actual examples provided by CSP's experts outweigh, in terms of persuasive force, Dr. Paul's speculations, which under the clear and convincing evidence standard come up short of establishing that the 50% by volume limitation is not supported.

Accordingly, we conclude that the CSP patents satisfy the written description requirement of 35 U.S.C. § 112.

D. Requirements for Proving Anticipation.

As the Federal Circuit explains: "Anticipation under 35 U.S.C. § 102(e) requires that 'each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' " In re Robertson, 169 F.3d 743, 745 (Fed. Cir. 1999) (quoting Verdegaal Bros., Inc. v. Union Oil Co., 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987)). To establish that an element is inherently described in a prior art reference, the "extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.' " Id. (quoting Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1268 (Fed. Cir. 1991). " 'Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' " Id. (quoting Continental Can, 948 F.2d at 1269).

SCI claims that the CSP patents are invalid because they were anticipated by Lancesseur, in that Lancesseur describes compositions containing a two polymer blend containing a desiccating agent. CSP responds that, because Lancesseur does not expressly or inherently disclose channel formation, it cannot be deemed to anticipate the CSP Patents.

1. Lancesseur Does Not Anticipate the CSP Patents.

The claims of the '255 and '937 patents both include a channel-forming limitation, which limitation is found neither expressly nor inherently in Lancesseur. Lancesseur does not discuss channels nor does it teach one skilled in the art as to the method of obtaining a co-continuous morphology in a system of two polymers, except through mere happenstance. Lancesseur never discusses channels nor their functional equivalent, but instead discusses mixing a polymer with an "elastomer," which presumably is added to provide structural toughness or flexibility to the compound. Clearly, channel formation is not expressly disclosed in Lancesseur.

Although it is possible that channels might form through the combination of various compounds within the ranges disclosed in Lancesseur, channel formation is also not inherently described in Lancessuer. Many of the elastomers listed in Lancesseur are more hydrophobic (more water repelling) than the polymer material and, thus, by definition, cannot serve as channeling agents. Moreover, as Dr. Macosko demonstrated, none of the examples discussed in Lancesseur would actually form channels. Further undermining SCI's contention is that fact that it performed no tests to determine if any of the compositions described by Lancesseur actually do form channels. Thus, the uncontroverted evidence demonstrates that many of the combinations disclosed in Lancesseur would most assuredly not form channels, but some as yet undisclosed combinations might possibly produce channels. Such a hypothetical showing is clearly insufficient to establish that Lancesseur anticipates channel formation. See In re Robertson, 169 F.3d at 745. SCI's burden at trial was to show that Lancesseur would describe to one skilled in the art the channel formation or describe a composition that formed channels from among the many possible combinations disclosed. See Ultradent Products, Inc. v. Life-Like Cosmetics, Inc., 127 F.3d 1065, 1072 (Fed. Cir. 1997). SCI has not satisfied that burden and, therefore, has failed to establish anticipation.

E. Requirements for Proving Obviousness.

Pursuant to 35 U.S.C. § 103(a), "A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1369 (Fed. Cir. 2000). "Obviousness is a question of law based on underlying facts." Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc., 424 F.3d 1293, 1302 (Fed. Cir. 2005). "The factual determinations relevant to the obviousness inquiry include: (1) the scope

and content of the prior art; (2) the differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations, if any, such as commercial success, unexpected results, copying, long-felt but unresolved need, and the failure of others to develop the invention." Syntex (U.S.A.) LLC v. Apotex, Inc., 407 F.3d 1371, 1378 (Fed. Cir. 2005).

Merely identifying in the prior art each individual element claimed in a patent "is insufficient to defeat patentability of the whole claimed invention." In re Kotzab, 217 F.3d at 1370 (In re Rouffet, 149 F.3d 1350, 1357 (Fed. Cir. 1998)). Instead, "there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant." Id. (citing In re Dance, 160 F.3d 1339, 1343 (Fed. Cir. 1998); In re Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984)). Even when obviousness is based on a single prior art reference, as is the case here, "there must be a showing of a suggestion or motivation to modify the teachings of that reference." Id. (citing B.F. Goodrich Co. v. Aircraft Braking Sys. Corp., 72 F.3d 1577, 1582 (Fed. Cir. 1996)).

A "critical step" in an obviousness analysis is "casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field." In re Kotzab, 217 F.3d at 1369 (citing In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999)). "Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one 'to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher.' " In re Kotzab, 217 F.3d at 1369 (quoting In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999)).

SCI contends that the CSP patents are obvious in light of the teaching of Lancesseur to

combine two polymers with a desiccant. CSP responds its patents are not obvious because Lancesseur does not expressly or inherently disclose or teach channels, there was no suggestion in the prior art to modify the teaching of Lancesseur to achieve channels, and secondary considerations reveal the claimed inventions were not obvious.

1. Lancesseur Does Not Render the CSP Patents Obvious.

SCI relies solely on Lancesseur for its obviousness challenge; however, as explained in the anticipation discussion, supra, Lancesseur neither expressly nor inherently discloses or teaches channels and SCI has presented no evidence of any suggestion or motivation in the prior art during the relevant time to modify Lancesseur to achieve channels. To the contrary, Lancesseur appears to teach away from the claimed inventions because Lancesseur "describes compositions that utilize fibers, not channels, to wick moisture to desiccant entrained within a polymer material." CSP's Trial Brief at 38. Although it is not clear from the text of Lancesseur what made the addition of fibers necessary or recommended,[59] SCI apparently believed the fibers were used for wicking moisture. In an internal SCI memorandum, dated March 9, 1998, Jean-Pierre Giraud, director of research and development at Airsec, stated (as translated for the Court): "AIRSEC use [sic] organic fibers (synthetic, animal or vegetable) to draw moisture from the outside to the inside of the material." DTX 17. This interpretation underscores the view that Lancesseur appears to teach away from the claimed inventions by suggesting methods other than channels to wick moisture within the polymer. In addition, Dr. Fredrickson, who was working on co-continuous morphology research problems at the time the CSP patents issued, testified that the creation of a channel morphology in a two polymers composition through the addition of

[59] Dr. Macosko also testified that he was not clear why there were fibers in Lancesseur.

desiccant particles was not an expected outcome. On the basis of this evidence, we hold that SCI has failed to establish that the claimed inventions were obvious.

Assuming *arguendo* that SCI had proven obviousness based on the Lancesseur patent, secondary considerations strongly indicate the claimed inventions were not obvious. CSP introduced convincing evidence showing that it has approximately 34 or 35 products that it is or was in the process of selling or bringing to market that incorporate the patented technology and that, for example, all the major manufacturers of diagnostic test strips use CSP's patented technology to package their products. CSP also presented evidence establishing the existence of a the long-felt need in the market place for a desiccant-entrained polymer that could effectively transmit moisture to the desiccant, which continued to be unsatisfied by the Lancesseur technology. In further recognition of its novelty, CSP's claimed invention received an award from the PTO for the most outstanding new patent of the year. Dr. Fredrickson also praised the claimed invention, stating: "I certainly appreciated it as a beautiful invention and it was certainly not an idea that was out in the

academic literature, the patent literature at the time [1997]." Moreover, SCI's own internal documents reveal that it also considered CSP's patented technology to be a considerable threat to SCI's established market position and, in an apparent effort to invalidate the CSP patents, SCI searched for and was unable to find any other prior art references that solved the same problems solved by the claimed inventions. These secondary considerations carry substantial weight in our determination that no claim of obviousness can succeed here, save that based on "the insidious effect of a hindsight syndrome."

F. SCI's Defense Invoking the On-Sale Bar is Untimely and Improper.

SCI's final contention is that the '255 patent claims are invalid under 35 U.S.C. §

102(b)[60] in light of CSP's attempt to sell the claimed invention more than one year prior to filing for the application for the eventual '255 patent. More specifically, SCI claims that CSP attempted to sell the Hekal technology as early as October 1996, (Tr. 45-49; PTX-370, PTX-368), and the application for the '255 patent was filed by CSP on July 27, 1998.

Despite not having expressly raised this defense prior to its Post-Trial Brief, SCI nonetheless contends that "CSP was well aware of SCI's on-sale bar defense, both during and after the trial." SCI's Post-Trial Reply Brief 20. SCI supports this assertion, claiming that "the evidence on which SCI relies for its defense was presented during the cross-examination of Mr. Abrams, who was the first witness in the case [and the evidence in question] could be relevant only to an on-sale bar defense." Id. SCI also notes that it "vigorously contested the admissibility of the certificate of correction for the '255 patent" which was "relevant only to a defense based on something that occurred between the priority date for the '937 patent, March 5, 1996, and the July 27, 1998 filing date for the later application that led directly to the '255 patent, namely the offers for sale in October of 1996." Id. We are not persuaded by these arguments, however. It would take no less an expert than Sherlock Holmes to piece together such disparate tidbits of information to discern SCI's true intentions with respect to asserting this attempted defense. The Federal Rules of Civil Procedure do not require a party to a litigation to retain Sherlock Holmes, or his functional equivalent, in order to grasp and then fend off opposing claims. As previously referenced, federal courts uniformly disapprove of trial by

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[60] 35 U.S.C. § 102(b) provides, in relevant part, that a person is not entitled to a patent if:

> the invention was . . . on sale in this country, more than one year prior to the date of the application for patent in the United States, . . .

ambush.[61] While there is some substance to SCI's assertion "that CSP was aware that SCI was asserting another invalidity argument, one that relied on a later filing date for the '255 patent" (SCI's Post-Trial Reply Brief at 20-21), it was not clear prior to SCI's filing of its Post-Trial Brief which invalidity argument SCI was intending to assert to establish a later filing date for the '255 patent. For example, there are several other invalidity arguments, in addition to the on-sale bar, available under 35 U.S.C. § 102 which would implicate a later filing date, including if:

> the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, . . .

35 U.S.C. § 102(a) & (b). Moreover, given SCI's fluid litigation strategy, featuring the adoption and abandonment of various theories throughout the proceedings, it became a virtual impossibility to predict with any degree of certainty which theory or theories SCI would argue at any given time.[62]

In addition to the unfairness imposed on CSP by, to use Dr. Paul's phrase, SCI's "evolving" theories of invalidity, SCI's actions have resulted in substantial impositions on the Court. SCI's failure to raise the on-sale bar defense in a timely manner is another example of such impositions whereby SCI has left resolution of an issue to the Court without a proper

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[61] See string cite in Legal Analysis Section II(A)(4), surpa.

[62] See, e.g., Factual Background Section IV(J) (SCI's "layers" defense); Legal Analysis Section II(A)(4) (SCI defense that HDI Product not made by the '937 Process); Legal Analysis II(B)(4) (SCI's evolving interpretation of the word "its"); Factual Background Section VII(A) (striking testimony by Dr. Paul about "preferential affinity" because it was not mentioned in his expert report). In addition, the Court sustained objections on numerous occasions during the trial foreclosing testimony elicited by SCI's attorneys that exceeded the scope of previous disclosures.

development of the factual record and the legal briefing.[63]

As a result, we determine SCI's defense based on the on-sale bar to be both untimely asserted and inadequately developed to warrant further consideration, much less adoption by this court. This defense is accordingly denied.

Conclusion

For all the reasons explicated above, the Court hereby declares that the '937 and '255 patents are valid and that SCI's offer to sell the HDI product infringed claims 1, 4, 7 and 25 of the '937 patent and claims 1 and 6 of the '255 patent. Judgment is thus awarded in favor of CSP and against SCI on these claims. IT IS SO ORDERED.

Date: _____ _____

[63] Another example arose with regard to the Utility Patent Application Transmittal sheet, on which CSP evidenced its clear intention to make the eventual '255 patent a continuation of the application for the eventual '937 patent; the Court was left to wonder whether it qualifies as part of "an application for patent" as required by 35 U.S.C. § 120? 35 U.S.C. § 120 provides, in relevant part:

> An application for patent . . . shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application.

CSP apparently believed that it does qualify as part of the application, see CSP's Post-Trial Reply Brief at 20, whereas SCI believed it does not qualify, see SCI's Post-Trial Brief at 48. However, neither party provided the court with any appropriate legal citations to help resolve this quandary. To its credit, SCI did specify that in its view CSP actions did not comport with the requirements in 37 C.F.R. 1.78(a)(2) (1997).

SARAH EVANS BARKER, JUDGE
United States District Court
Southern District of Indiana

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