IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY
CAMDEN VICINAGE

SUPERNUS PHARMACEUTICALS, INC., Plaintiff, v. TWI PHARMACEUTICALS, INC. and TWI INTERNATIONAL LLC d/b/a TWI PHARMACEUTICALS USA, Defendants.	Civil No. 15-369 (RMB/JS) **OPINION** **FOR PUBLIC VIEWING**

APPEARANCES:

Charles Michael Lizza, Esq.
William C. Baton, Esq.
Sarah Ann Sullivan, Esq.
Saul Ewing, LLP
One Riverfront Plaza
Newark, NJ 07102

Edgar H. Haug, Esq.
Nicholas F. Giove, Esq.
Andrew S. Roper, Esq.
Erika Vanessa Selli, Esq.
Kevin J. Georgek, Esq.
Rachel P. McClure, Esq.
Stephanie M. Roberts, Esq.
Jonathan A. Herstoff, Esq.
Laura A. Chubb, Esq.
Haug Partners LLP
745 Fifth Avenue, Suite 10
New York, NY 10151
Attorneys for Plaintiff Supernus Pharmaceuticals, Inc.

Karen A. Confoy, Esq.
Allison Linda Hollows, Esq.
Fox Rothschild LLP
997 Lenox Drive, Building 3
Lawrenceville, NJ 06648

Don J. Mizerk, Esq.
John A. Sholar, Esq.
Marc R. Wezowski, Esq.
Dustin L. Taylor, Esq.
Husch Blackwell LLP
120 S. Riverside Plaza, Suite 2200
Chicago, IL 60606

Attorneys for Defendants TWi Pharmaceuticals, Inc. and TWi International LLC d/b/a TWi Pharmaceuticals USA

BUMB, UNITED STATES DISTRICT JUDGE:

TABLE OF CONTENTS

I. INTRODUCTION

This is an action for patent infringement brought by Plaintiff Supernus Pharmaceuticals, Inc. ("Supernus" or the "Plaintiff") against Defendants TWi International LLC and TWi Pharmaceuticals, Inc. (together, "TWi" or the "Defendants"), pursuant to 35 U.S.C. § 271(e)(2)(A) and 35 U.S.C. §§ 271(a), (b), and (c).

This case involves Supernus's Oxtellar XR® product, a once-a-day extended release oxcarbazepine tablet for the treatment of partial epilepsy seizures in adults and children above the age of six. Supernus seeks to prevent TWi from selling a generic version of Oxtellar XR®, in connection with TWi's submission of Abbreviated New Drug Application ("ANDA") No. 206576, seeking the approval of the United States Food & Drug Administration ("FDA") to market its generic version of Oxtellar XR® (the "ANDA Product" or the "TWi Tablets") prior to the expiration of certain patents held by Supernus. Specifically, Supernus alleges that, in selling its ANDA Product, TWi will infringe U.S. Patent Nos. 7,722,898 (the "'898 Patent"), 7,910,131 (the "'131 Patent"), and 8,821,930 (the "'930 Patent") (collectively, the "Supernus Patents" or the "Patents-in-Suit").[1] Supernus asserts Claims 1 and 11 of the

[1] The Complaint also asserted that TWi would infringe U.S. Patent No. 8,617,600. By stipulation, the parties agreed to

’898 Patent, Claims 1, 11, and 21 of the ’131 Patent, and Claims 1 and 19 of the ’930 Patent. The asserted claims all require a homogeneous matrix comprising the active pharmaceutical ingredient (“API”), oxcarbazepine, a matrix-forming polymer, a solubility-enhancing agent, and a release-promoting agent.

Claim 1 of the ’898 Patent provides:[2]

> 1. A pharmaceutical formulation for once-a-day administration of oxcarbazepine comprising a homogeneous matrix comprising:
>
> (a) oxcarbazepine;
>
> (b) a matrix-forming polymer selected from the group consisting of cellulosic polymers, alginates, gums, cross-linked polyacrylic acid, carrageenan, polyvinyl pyrrolidone, polyethylene oxides, and polyvinyl alcohol;
>
> (c) at least one agent that enhances the solubility of oxcarbazepine selected from the group consisting of surface active agents, complexing agents, cyclodextrins, pH modifying agents, and hydration promoting agents; and
>
> (d) at least one release promoting agent comprising a polymer having pH-dependent solubility selected from the group consisting of cellulose acetate phthalate, cellulose acetate succinate, methylcellulose phthalate, ethylhydroxycellulose phthalate, polyvinylacetate phthalate, polyvinylbutyrate acetate, vinyl acetate-maleic anhydride copolymer, styrene-maleic mono-ester copolymer, and Eudragit L 100-55 (Methacrylic Acid-Ethyl Acrylate Copolymer (1:1)), and methyl acrylate-methacrylic acid copolymers.

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limit the litigation to the ’898 Patent, the ’131 Patent, and the ’930 Patent [Docket No. 197].

[2] Although the Patents-in-Suit share the same specifications, they are slightly different. For convenience, citations to the specifications of the Patents-in-Suit are to the ’898 Patent, unless otherwise noted.

The dependent claims of the Patents-in-Suit include additional limitations, generally specifying the types of excipients for the matrix-forming polymer, solubility enhancing agent, and release promoting agent, and/or the nature of the dosage form.

The Court conducted a four-day bench trial from April 3, 2017 through April 6, 2017. It then permitted the parties to submit post-trial briefing.[3]

After considering all the evidence, as well as the parties' submissions, and for the reasons set forth herein, the Court finds that: (1) TWi's ANDA Product will infringe each of the Patents-in-Suit; and (2) each of the Patents-in-Suit is valid. Accordingly, the Court enters judgment against TWi and in favor of Supernus as to the '898 Patent, the '131 Patent, and the '930 Patent. This Opinion constitutes the Court's findings of fact and conclusions of law pursuant to Federal Rule of Civil Procedure 52(a).

[3] The Court expresses its appreciation to counsel for their professionalism and valuable contributions to this litigation.

II. BACKGROUND[4]

A. The Drug Approval Process

Under the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 301, et seq., the FDA must approve all new drugs before they may be distributed in interstate commerce. 21 U.S.C. § 355(a). To secure approval for a new drug, an applicant may file a New Drug Application ("NDA") that includes, inter alia, the number and expiration date of any patents which claim the drug or a method of using the drug if a claim of patent infringement could reasonably be asserted. Id. § 355(b)(2). "The FDA publishes the names of approved drugs and their associated patent information in the Approved Drug Products with Therapeutic Equivalence Evaluations list, commonly referred to as the 'Orange Book.'" AstraZeneca LP v. Apotex, Inc., 633 F.3d 1042, 1045 (Fed. Cir. 2010). An applicant seeking approval to market a generic version of a drug that has already been approved by the FDA may file an ANDA, which "allows an applicant to rely on the safety and efficacy information for the listed drug if the applicant can show that the generic drug is 'bioequivalent' to the listed drug." Id. (citing 21 U.S.C. §§ 355(b)(2), 355(j)).

[4] As this civil action arises under the United States patent laws, Title 35 of the United States Code, this Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

"[F]or each patent listed in the Orange Book that claims either the listed drug or a use of the listed drug for which the applicant is requesting approval, an ANDA must include either one of four certifications or a 'section viii statement.'" AstraZeneca LP, 633 F.3d at 1046. If an applicant submits a certification, the applicant must certify "(I) that . . . patent information has not been filed, (II) that such patent has expired, (III) . . . the date on which such patent will expire, or (IV) that such patent is invalid or will not be infringed by the manufacture, use, or sale of the new drug." 21 U.S.C. § 355(j)(2)(A)(vii)(I)-(IV). The last of these is known as a "paragraph IV certification." If an ANDA applicant submits a paragraph IV certification and a patent infringement suit is commenced within 45 days, then the FDA may not approve the ANDA until the expiration of a 30-month statutory period. Id. § 355(c)(3)(C).

B. The Patents-in-Suit

The Patents-in-Suit describe and claim a specific type of oxcarbazepine formulation for the treatment of seizures with a "homogeneous matrix" containing the active ingredient, oxcarbazepine, and certain categories of excipients. The "homogeneous matrix" is central to the claimed invention.

i. The ’898 Patent

On May 25, 2010, the United States Patent and Trademark Office (the “PTO”) issued the ’898 Patent, entitled “Modified-Release Preparations Containing Oxcarbazepine and Derivatives Thereof.” PTX 1(A). The named inventors are Dr. Padmanabh P. Bhatt, Dr. Argaw Kidane, and Dr. Kevin Edwards. The ’898 Patent was filed on April 13, 2007 as Application No. 11/734,874 and is related to Provisional Application No. 60/794,837, filed on April 26, 2006. The ’898 Patent expires on April 13, 2027. PTX 1(A); Joint Final Pretrial Order, Stipulated Facts (“SF”) ¶ 12. The ’898 Patent covers an oxcarbazepine formulation administered once-daily for the treatment of seizures. PTX 1(A).

ii. The ’131 Patent

The ’131 Patent, entitled “Method of Treating Seizures Using Modified Release Formulations of Oxcarbazepine,” was filed on August 27, 2008 as Application No. 12/230,276, which was a continuation of Application No. 11/734,874, filed on April 13, 2007. PTX 2(A). The ’131 Patent is also related to Provisional Application No. 60/794,837, filed on April 26, 2006. The ’131 Patent was issued by the PTO on March 22, 2011 and expires on April 13, 2027. PTX 2(A); SF ¶ 13. The ’131 Patent covers a method of treating seizures by administrating an oxcarbazepine pharmaceutical formulation. PTX 2(A).

iii. The ’930 Patent

The ’930 Patent, entitled “Modified Release Preparations Containing Oxcarbazepine and Derivatives Thereof,” was filed on December 11, 2013 as Application No. 14/103,103, which was a continuation of Application No. 13/476,337, filed on May 21, 2012, which is, in turn, a continuation of Application No. 13/137,382, filed on August 10, 2011, which is a division of Application No. 12/230,275, filed on August 27, 2008, which is a continuation of Application No. 11/734,874, filed on April 13, 2007. It is also related to Provisional Application No. 60/794,837, filed on April 26, 2006. PTX 4(A); SF ¶ 14. The ’930 Patent issued on September 2, 2014 and expires on April 13, 2027. The ’930 Patent covers an oxcarbazepine formulation for the treatment of seizures. Its terms are largely similar to those of the ’898 Patent, but also include, in relevant part, certain percentages by weight of the formulation limitations.

TWi disputes Supernus’s claims relating to each of the Patents-in-Suits on the grounds of non-infringement and invalidity.

C. Oxtellar XR®

In October 2012, the FDA approved NDA No. 202810 for an oxcarbazepine extended-release oral tablet, which Supernus markets under the name Oxtellar XR®. Its sole active ingredient is oxcarbazepine. Oxtellar XR® is indicated for use as a once-daily adjunctive therapy in the treatment of partial seizures in adults and children 6 to 17 years of age. SF ¶¶ 1, 6.

D. TWi's ANDA

On December 30, 2013, TWi filed ANDA No. 206576 with the FDA seeking regulatory approval to market extended-release oxcarbazepine oral tablets in 150 mg, 300 mg, and 600 mg dosages. SF ¶ 27. TWi's ANDA identifies the listed drug product that is the basis for the submission as Oxtellar XR®. PTX 88.5. TWi's ANDA included a paragraph IV certification asserting that the '898, '131, and '930 Patents are invalid, unenforceable, or will not be infringed by the manufacture or sale of its generic extended-release oxcarbazepine tablets. SF ¶ 27. On January 18, 2017, TWi submitted an ANDA amendment to the FDA, which included changes to the formulation of TWi's 150 mg and 300 mg tablets only. SF ¶ 28. [redacted]

III. LEGAL ANALYSIS

To prove infringement, the patentee must show that it is more likely than not that the proposed ANDA product would, if commercially marketed, meet all of the claim limitations of the Patents-in-Suit. See Adams Respiratory Therapeutics, Inc. v. Perrigo Co., 616 F.3d 1283, 1287 (Fed. Cir. 2010) (en banc); Abbott Labs. v. TorPharm, Inc., 300 F.3d 1367, 1373 (Fed. Cir. 2002) (infringement analysis turns on whether accused product satisfies every limitation of the claim in question). In other words, the patentee "has the burden of proving infringement by a preponderance of the evidence." Kegel Co., Inc. v. AMF Bowling, Inc., 127 F.3d 1420, 1425 (Fed. Cir. 1997); SmithKline Diagnostics, Inc. v. Helena Labs. Corp., 859 F.2d 878, 889 (Fed. Cir. 1988). Determining whether an accused product infringes the patent involves a two-step analysis. Kegel, 127 F.3d at 1425. The Court must first construe the scope and meaning of the asserted claims and then compare the accused product to the properly construed claims. Id.

Before beginning this two-step analysis, the Court observes that, although the parties do not agree on the exact definition of a person of ordinary skill in the art, sometimes referred to as a POSA, their respective definitions are fairly similar and they have made no arguments as to which definition the Court

should adopt.[5] More importantly, the parties have not identified how the Court's analysis would differ depending on the definition adopted. Nonetheless, the Court sees no material difference between the definitions put forth by the parties and finds that its claim construction, infringement, and validity analyses would be the same under either definition.

A. Claim Construction

As for the first step, on August 31, 2015, the parties filed their Joint Claim Construction and Prehearing Statement, pursuant to Local Patent Rule 4.3 and the Court's July 17, 2015 Scheduling Order [Docket No. 64]. On October 7, 2015, the Court conducted a Markman hearing [Docket No. 81]. The Court

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[5] According to Supernus's expert witness, Dr. Steven Little, a POSA in this context is a "person with at least a bachelor of science degree in pharmaceutical sciences or a related field and approximately three to five years of experience in the field of drug delivery technology or a related field or a person of commensurate education and experience." Tr. 922:17-24 (Little Direct).

Dr. Edmund Elder, TWi's expert, in turn proposed the following definition of a POSA:

> [A] person of ordinary skill in the art would have ordinary skills in pharmaceutical modified release solid oral drug delivery system formulation. They would also, as of 2006, have a professional or graduate degree in pharmacy, chemistry, chemical engineering or a related discipline, with experience in formulating drugs. They would also have a general understanding of drugs used to treat seizures, background information regarding the chemistry and the formulation approaches successfully applied to these drugs.

Tr. 799:21-800:10 (Elder Direct).

construed several terms, of which the only disputed claim term that remains contested at this juncture is "agent that enhances the solubility of oxcarbazepine." The parties stipulated to the Court's construction of the term "homogeneous matrix" in a related action, Supernus Pharm., Inc. v. Actavis, Inc., Civil Action Nos. 13-4740, 14-1981 (the "Actavis Matter"). Joint Claim Construction Br. at 5 [Docket No. 64].[6]

Claim construction is a question of law. See Markman v. Westview Instruments, Inc., 517 U.S. 370, 391 (1996). The Court determines the meaning of disputed claim terms as understood by one of ordinary skill in the art at the time of invention. See Phillips v. AWH Corp., 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc). Claim terms generally should be given their ordinary and customary meaning to a person of skill in the art at the time of the invention. See id. To determine the ordinary

[6] Prior to trial, TWi moved in limine to preclude all references by Supernus to the evidence or decision in the Actavis Matter [Docket No. 224]. The Court denied the motion on March 30, 2017 [Docket No. 242]. In its motion, TWi argues that "Supernus' case against TWi must stand on its own." Supernus does not dispute this and recognizes that the Actavis Matter does not have preclusive effect on TWi. Nonetheless, Supernus contends that a blanket ban on all references to the Actavis Matter is unwarranted and improper. The Court agrees. TWi's request to preclude all references to the Actavis Matter is overbroad. While this Court's findings of fact and conclusions of law set forth herein are based upon the evidence and argument presented in this litigation, the Court nonetheless believes that the Actavis Matter has some relevance to this action and, for this reason, denied TWi's motion to preclude all references to the Actavis Matter at trial.

meaning, the Court first looks to the intrinsic evidence, which includes the claims, the specification, and the prosecution history. Id. at 1312-17 ("Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent.").

The starting point for claim interpretation is the claim language itself, which can "provide substantial guidance as to the meaning of particular claim terms." Id. at 1314. Thus, the language of the claims is paramount. Pass & Seymour, Inc. v. Int'l Trade Comm'n, 617 F.3d 1319, 1324 (Fed. Cir. 2010); see Chef Am., Inc. v. Lamb-Weston, Inc., 358 F.3d 1371, 1374 (Fed. Cir. 2004) ("in accord with our settled practice we construe the claim as written, not as the patentees wish they had written it"). The claims, however, "must be read in view of the specification, of which they are a part." Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed Cir.), aff'd, 517 U.S. 370 (1996). Extrinsic evidence, such as dictionaries, may be consulted to assist in understanding disputed terms. Phillips, 415 F.3d at 1318. Extrinsic evidence, however, must be "considered in the context of the intrinsic evidence." Id. at 1317-19.

i. Homogeneous Matrix

The parties agreed to adopt the Court's construction of the term "homogeneous matrix" in the Actavis Matter. Joint Claim

Construction Br. at 5. In the Actavis Matter, the Court construed the term "homogeneous matrix" as "a matrix in which the ingredients or constituents are uniformly dispersed." Markman Order, Civ. Action No. 13-4740 [Docket No. 244]. The Court incorporates its reasoning for this claim construction as set forth in its February 5, 2016 Opinion in the Actavis Matter. Supernus Pharm. Inc. v. Actavis Inc., 2016 WL 527838, at *6–8 (D.N.J. Feb. 5, 2016), aff'd, 665 F. App'x 901 (Fed. Cir. 2016).

ii. Agent that Enhances the Solubility of Oxcarbazepine

The Court construed the term "an agent that enhances the solubility of oxcarbazepine" as "an agent, other than oxcarbazepine, that enhances the solubility of oxcarbazepine, which agent cannot also serve as the sole matrix-forming polymer in 1(b) or the sole release promoting agent in 1(d) in claim 1." Markman Order ¶ 2 [Docket No. 84]. The parties had proposed the following constructions:

Claim Term	Supernus's Proposed Construction	TWi's Proposed Construction
"agent that enhances the solubility of oxcarbazepine"	Requires no construction – plain and ordinary meaning ("an agent that functions to increase the aqueous solubility of the oxcarbazepine")	"an agent that functions to increase the aqueous solubility of oxcarbazepine to a point where it impacts the availability of the drug for systemic absorption in patients, which is not: (a) oxcarbazepine, (b) a matrix-forming polymer, or (c) a release promoting agent"

Joint Claim Construction Br., Ex. A.

The parties did not genuinely dispute that the plain and ordinary meaning of the term "agent that enhances the solubility of oxcarbazepine" was an "agent that functions to increase the aqueous solubility of oxcarbazepine." That is evident from their respective proposed constructions. TWi, however, wished to further limit the term in two ways. First, TWi sought the addition of essentially a materiality provision, requiring that the increase in aqueous solubility of oxcarbazepine be "to a point where it impacts the availability of the drug for systemic absorption in patients." At the Markman hearing, however, the parties agreed that the solubility enhancing agent must result in an increase in the solubility of oxcarbazepine that was more than de minimis. Markman Tr. 66:22-68:1 [Docket No. 85]. In light of the parties' agreement on this issue, the Court declined to expressly supplement the claim language in this respect.

Second, TWi argued that the solubility enhancing agent cannot be oxcarbazepine, a matrix-forming polymer, or a release promoting agent. TWi expressed concerns regarding a construction that permitted a single excipient that serves several different functions to satisfy multiple claim elements. The Court agreed that such "double duty" was not envisioned by the inventors or in the specifications or claim language of the Patents-in-Suit. For example, the specifications state that a

"combination of solubility and release promoters is contemplated in this invention." '898 Patent, col. 4, ll. 14-16 (emphasis added). In this Court's view, it is clear that a person skilled in the art would understand the claim language to require that a single excipient cannot serve, for example, as both the only solubility enhancing agent and the only release promoting agent in the formulation. TWi's proposed construction, however, is unnecessarily restrictive. Nothing in the claim language, the specifications, or the prosecution history suggests that an excipient cannot function as an agent that enhances the solubility of oxcarbazepine just because it also can function as a matrix-forming polymer or a release promoting agent, so long as the formulation also contains a distinct matrix-forming polymer and release promoting agent. Accordingly, the Court adopted a variation of TWi's proposed construction that eliminated the possibility of improper "double duty," while recognizing that excipients may serve several functions at once.

At trial, however, the parties conveyed to the Court that its construction of the term "agent that enhances the solubility of oxcarbazepine" was no longer relevant to the infringement theories or defenses advanced by the parties. Tr. 28:8-30:13.

B. Infringement

i. The Patents-in-Suit

As for the second step of the infringement analysis, the Court must determine whether the accused product contains every limitation of the properly construed claims. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1467 (Fed. Cir. 1998).

The Patents-in-Suit are directed to "controlled-release preparations of oxcarbazepine and derivatives thereof for once-a-day administration." '898 Patent, col. 1, ll. 14-16; '131 Patent, col. 1, ll. 16-18; '930 Patent, col. 1, ll. 22-24. Supernus asserts that TWi will infringe Claims 1 and 11 of '898 Patent, Claims 1, 11, and 21 of the '131 Patent, and Claims 1 and 19 of the '930 Patent. Claim 1 of each of the Patents-in-Suit, the only independent claim, requires a "pharmaceutical formulation comprising a homogeneous matrix," which in turn comprises four constituents:

> (a) oxcarbazepine;
>
> (b) a matrix-forming polymer selected from the group consisting of cellulosic polymers, alginates, gums, cross-linked polyacrylic acid, carrageenan, polyvinyl pyrrolidone, polyethylene oxides, and polyvinyl alcohol;
>
> (c) at least one agent that enhances the solubility of oxcarbazepine selected from the group consisting of surface active agents, complexing agents, cyclodextrins, pH modifying agents, and hydration promoting agents; and
>
> (d) at least one release promoting agent comprising a polymer having pH-dependent solubility selected from the group consisting of cellulose acetate phthalate,

> cellulose acetate succinate, methylcellulose phthalate, ethylhydroxycellulose phthalate, polyvinylacetate phthalate, polyvinylbutyrate acetate, vinyl acetate-maleic anhydride copolymer, styrene-maleic mono-ester copolymer, and Eudragit L 100-55 (Methacrylic Acid-Ethyl Acrylate Copolymer (1:1)), and methyl acrylate-methacrylic acid copolymers.

Claim 1 of the ’898 Patent also requires that the pharmaceutical formulation be for “for once-a-day administration.” Claim 1 of the ’131 Patent discloses a “method of treating seizures” through the administration of the pharmaceutical formulation described above. Claim 1 of the ’930 Patent largely replicates Claim 1 of the ’898 Patent. It also, however, includes percent by weight of the formulation limitations, as follows:

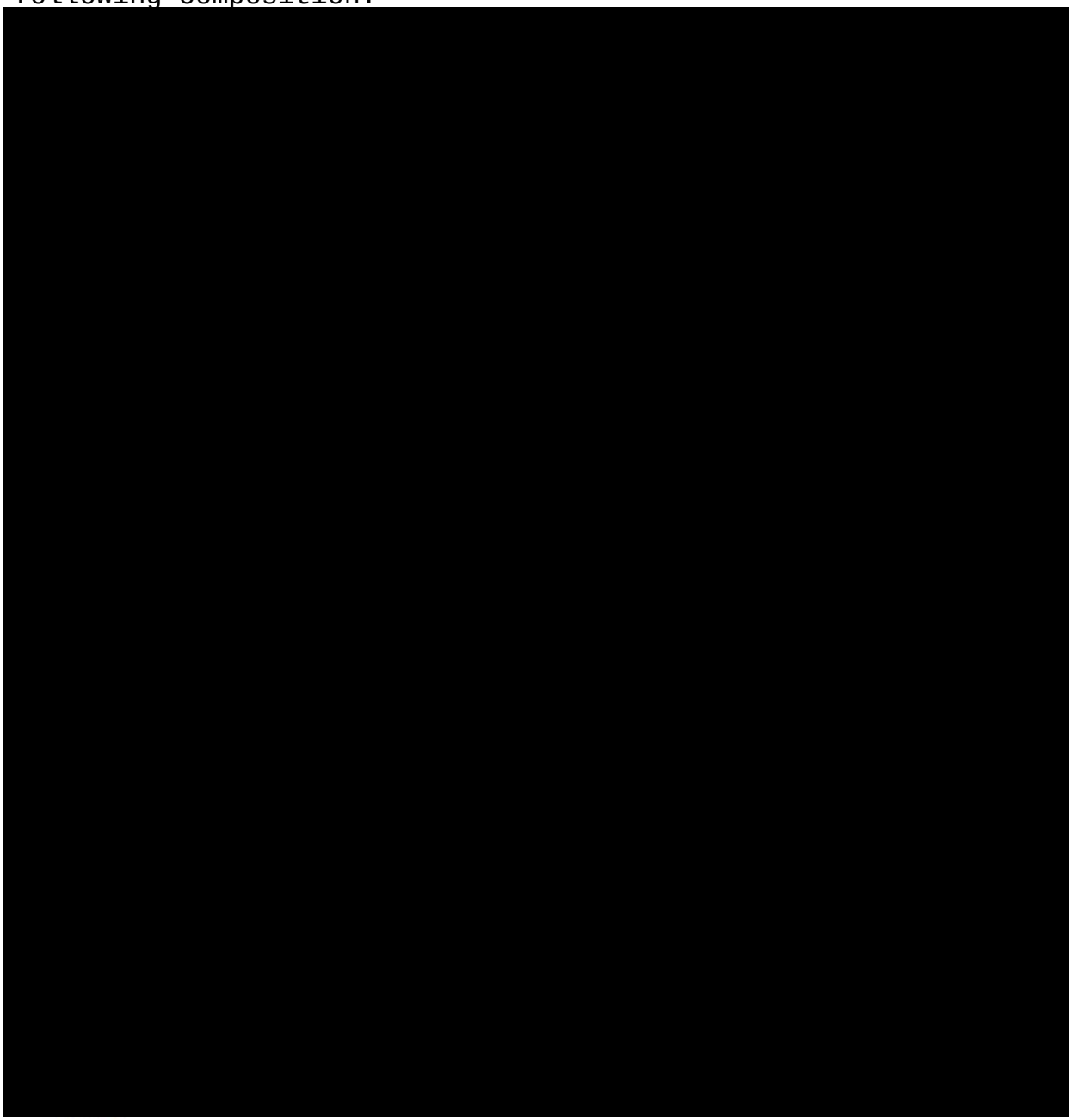
> (a) oxcarbazepine;
>
> (b) 1-50%, by weight of the formulation, a matrix-forming polymer;
>
> (c) 1-80%, by weight of the formulation, at least one agent that enhances the solubility of oxcarbazepine; and
>
> (d) 10-90%, by weight of the formulation, at least one release promoting agent comprising a polymer having pH-dependent solubility selected from the group consisting of cellulose acetate phthalate, cellulose acetate succinate, methylcellulose phthalate, ethylhydroxycellulose phthalate, polyvinylacetate phthalate, polyvinylbutyrate acetate, vinyl acetate-maleic anhydride copolymer, styrene-maleic mono-ester copolymer, Eudragit L100-55 (Methacrylic Acid—Ethyl Acrylate Copolymer (1:1)), and methyl acrylate-methacrylic acid copolymers.

The remaining asserted claims are all directly or indirectly dependent on Claim 1, meaning that they include all

of the limitations of Claim 1 as well as additional limitations, generally related to the type of dosage form.

ii. The TWi ANDA Product

The parties have stipulated that the TWi Tablets have the following composition:



Stipulation ¶ 8 [Docket No. 195-1].

Supernus contends that the TWi Tablets infringe Claim 1 of each of the Patents-in-Suit and certain claims that depend upon Claim 1 of the Patents-in-Suit. TWi does not dispute that its tablets contain certain elements of Claim 1. Specifically, TWi admits that its tablets are meant for once-a-day administration for the treatment of seizures. SF ¶ 43. Further, there is no dispute that TWi's label and prescribing information state that the TWi Tablets are to be used to treat seizures. PTX 101.1. TWi also admits for purposes of this litigation that its tablets contain element 1(a), oxcarbazepine, at least one element 1(b) matrix-forming polymer, and at least one element 1(d) release promoting agent comprising a polymer with pH-dependent solubility. Stipulation ¶¶ 1, 8.

The parties' infringement dispute centers on the remaining two claim elements: the presence of a "homogeneous matrix" and an element 1(c) "agent that enhances the solubility of oxcarbazepine." The Court's infringement analysis shall, therefore, be limited to these two claim elements.

1. <u>Claim 1</u>

(a) Homogeneous Matrix

All of the asserted claims require a pharmaceutical formulation of oxcarbazepine "comprising a homogeneous matrix . . . ." '898 Patent, Claim 1; '131 Patent, Claim 1, '930 Patent, Claim 1. As noted above, the Court construed

"homogeneous matrix" to mean a "matrix in which the ingredients or constituents are uniformly dispersed." Markman Order, Civ. Action No. 13-4740. As demonstrated by the prosecution history, the term "homogeneous matrix" was added to Claim 1 through two consecutive Office Action responses to overcome prior references that purportedly disclosed element 1(d) release promoting agents in the tablet coating. Stated differently, the term "homogeneous matrix" was added to the claims to distinguish Supernus's invention, which has all four matrix components in the tablet core, from the prior art references, which contained certain matrix constituents solely in the coating, which the Patent Examiner viewed to be part of the matrix. The term was not added to describe the degree of uniformity or homogeneity of the Supernus invention or to distinguish the degree of uniformity of Supernus's invention from that of prior art formulations. See PTX 5.205-07, 262-70, 281, 290-300; Tr. 566:15-569:5, 572:18-574:13 (Little Direct).

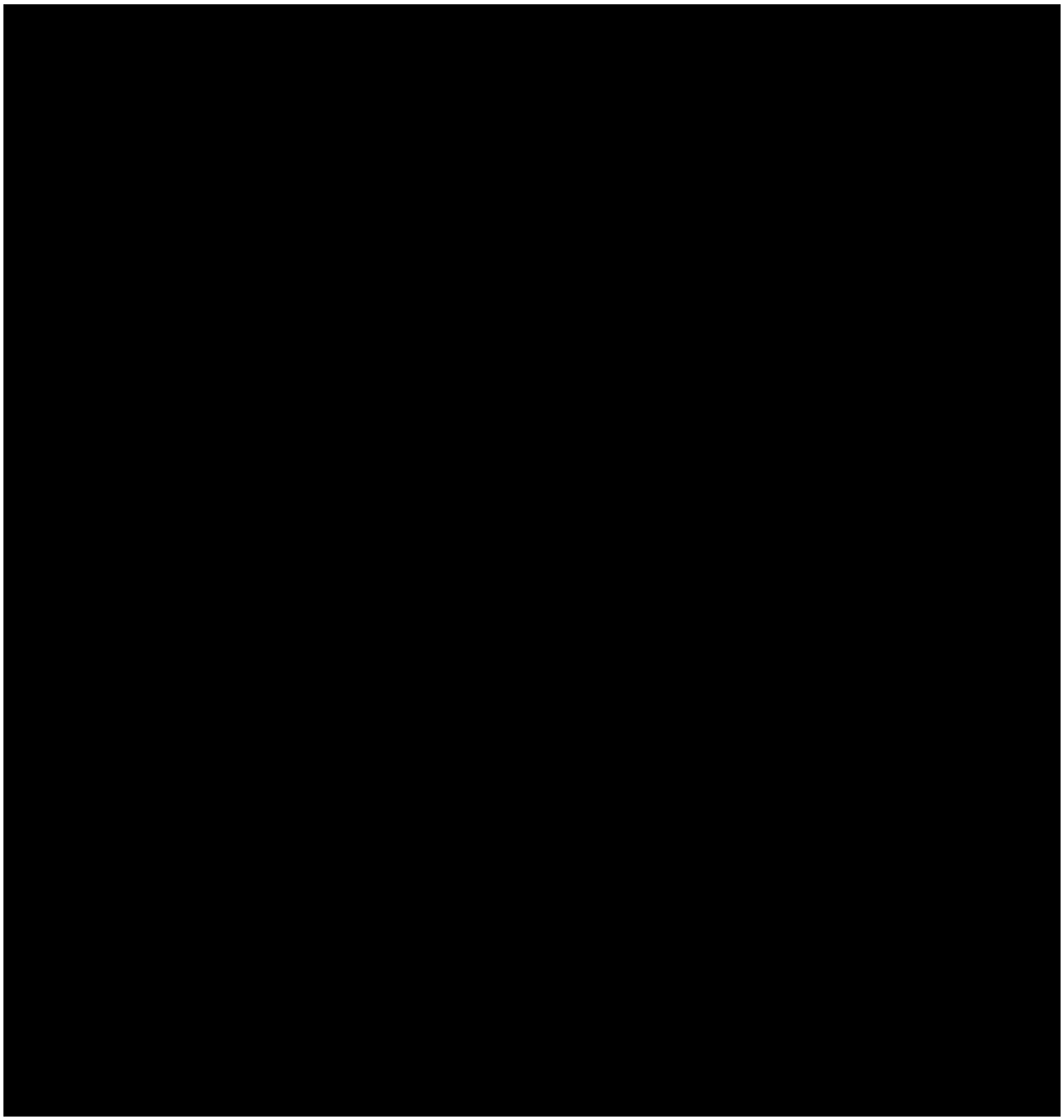
To carry its burden of proving infringement as to the "homogeneous matrix" limitation, Supernus presented evidence regarding (1) the manufacturing process by which TWi creates its ANDA Product, (2) FDA-required uniformity testing, and (3) chemical imaging. The Court addresses each in turn.

Manufacturing Process

Supernus contends that TWi's manufacturing process establishes that the TWi Tablets comprise a homogeneous matrix in which the constituents are uniformly dispersed. In support of this position, Plaintiff presented the testimony of several expert witnesses.

Plaintiff's experts credibly testified that the default objective of a person skilled in the art when developing a matrix-based formulation would be to form a homogeneous matrix. PTX 5.298; Tr. 567:5-19, 589:9-14 (Little Direct). Indeed, absent a specific objective not to be homogeneous, the default objective of a skilled formulator is to create a homogeneous matrix formulation comprising a uniform dispersion of ingredients. Tr. 589:9-14, 590:2-12 (Little Direct); Tr. 170:21-172:16 (Bugay Direct). Moreover, TWi's expert witness, Dr. Elder, did not genuinely dispute this proposition. Tr. 819:20-820:3 (Elder Direct); Tr. 910:4-23 (Elder Cross). No evidence in the record indicates that TWi's formulators sought to stray from this default objective in formulating its ANDA product. Tr. 589:9-14 (Little Direct); see also id. 577:19-583:23. In fact, for the reasons set forth below, the Court finds that TWi's manufacturing process establishes that its tablets comprise a homogeneous matrix.

TWi's manufacturing process involves several steps. The parties have stipulated that the TWi Tablets are manufactured according to the following process, set forth in TWi's Quality Overall Summary, included in its ANDA:



Stipulation ¶ 9.

Dr. Little testified extensively regarding the manufacturing process utilized by TWi. The process involves five stages: (1) pre-mixing/wet granulation; (2) drying; (3) milling; (4) blending; and (5) tableting/compression. PTX 364.9; Tr. 577:19-578:19 (Little Direct). Dr. Little explained that "[t]he purpose of these steps [is] to mix all of the ingredients together uniformly." Tr. 578:15-19 (Little Direct).

The first step, pre-mixing or wet granulation, involves "tak[ing] all of th[e] ingredients, and that includes the [redacted], and mix[ing] them up really well, and then essentially you're forming granules." Id. 582:10-15. [redacted]

[redacted] Id. 579:5-11, 586:5-10; PTX 367.17.

[redacted] M. Tr. 579:12-20, 586:12-19 (Little Direct); PTX 367.18. [redacted]

[redacted] Tr. 581:15-24 (Little Direct). Thereafter, the ingredients are wet granulated to "ensure content uniformity." PTX 88.16; PTX 364.6. In its ANDA, TWi explained that [redacted]

[redacted]

TWi, however, contends that its manufacturing process does not result in tablets that comprise a homogeneous matrix, due to the "paradox" of high-shear granulation. Dr. Elder, TWi's expert, explained this concept as follows:

> It's utilized to indicate in this case that high-shear granulation can result in non-homogeneous granules. Many people would expect mixing processes, especially high shear, to make things uniform, when in reality that term -- the conundrum or paradox is that some of the materials are nonhomogeneous.

Tr. 819:20-820:4 (Elder Direct). Relying upon relevant scientific literature, Dr. Elder explained that "[a] major disadvantage is that granulation can introduce inhomogeneity.

. . . The inhomogeneity is expressed as a granule size dependent variation in composition." Id. 820:4-12. Critically, however, there is no evidence whatsoever in the record that the so-called paradox actually resulted in the formation of non-homogeneous granules in the TWi Tablets. Indeed, as Supernus correctly notes, TWi specifically explained to the FDA that it had optimized its high-shear wet granulation manufacturing process for the express purpose of achieving "a better granulation," i.e. obtaining "more uniform granules." PTX 88.16 ("Granulation using high shear mixer directly impacted wet granule size, granule density and compressibility of the final blend. . . . A slow impeller and a low chopper speed lead to unevenly wetted granules. The setting of the parameter is optimized for a better granulation."); Tr. 587:9-14 (Little Direct) (quoting TWi's ANDA, "an additional two minutes of mixing after this point, after the addition of the granulation solution will result in more uniform granules.").

Given TWi's own description of the purpose of each step in its manufacturing process, the Court gives TWi's arguments about granule inhomogeneity no weight. See, e.g., PTX 88.16 ("Granulation was required to improve flow and ensure content uniformity. High shear mixer was selected due to intimate mixing of API and other excipients are [sic] rapidly achieved."); PTX 88.17 (impeller/chopper speed "optimized for a better

granulation. Adequate speed is important for well mixing and distribution of raw materials."). Furthermore, the Patents-in-Suit clearly contemplated the formation of granules and did not view the formation of such granules to be an impediment to the creation of a homogeneous matrix. See, e.g., '898 Patent, col. 5, ll. 1-9, 22.

Moreover, the Court agrees with Supernus that "the homogeneity or inhomogeneity of a **discrete granule** has no bearing on TWi's infringement of the 'homogeneous **matrix**' claim limitation." Pl. Br. at 12 [Docket No. 272] (emphasis in original). Claim 1 of the Patents-in-Suit addresses the homogeneity of the tablet matrix, not the homogeneity of any individual granules within the matrix. Each TWi Tablet contains tens of thousands of granules. Tr. 919:25-920:19 (Little Direct). As Dr. Little testified, the proper scale of scrutiny in assessing whether the ANDA Product satisfies the homogeneous matrix limitation of Claim 1 of the Patents-in-Suit is the scale of the tablet, not the granules. Id. 925:6-926:3. Dr. David Bugay, Supernus's expert in spectroscopy, also focused on the homogeneity of the tablet matrix, rather than the granules. Nonetheless, he concluded based upon the Raman chemical images he created of the sample TWi Tablet, discussed in detail below, that the granules themselves are uniformly dispersed across the tablet matrix. Tr. 168:13-19, 174:2-7 (Bugay Direct). Thus,

the Court finds that there is no evidence that suggests that TWi's manufacturing process resulted in inhomogeneous granules in its tablets. Furthermore, as the granules in the TWi Tablets are themselves uniformly dispersed across the tablet matrix, any theoretical granule inhomogeneity introduced by high-shear wet granulation does not result in an inhomogeneous matrix.

[redacted] Tr. 584:20-25 (Little Direct); PTX 367.38. Dr. Little persuasively testified that [redacted] does not affect the blend uniformity achieved throughout the previous steps. Tr. 583:3-8 (Little Direct). Likewise, Dr. Elder did not identify any evidence of de-mixing between [redacted]. Tr. 899:9-13 (Elder Cross). Based on his review of the Quality Overall Summary, manufacturing batch records, and product development report included in TWi's ANDA, Dr. Little opined that TWi's high shear wet granulation manufacturing process results in a homogeneous matrix tablet in which all constituents are uniformly dispersed. Tr. 565:6-566:2 (Little Direct).

Dr. Bugay, Supernus's expert in spectroscopy, also reviewed TWi's manufacturing process as set forth in its ANDA. Based upon his review of TWi's manufacturing process and his knowledge of and experience with wet granulation processes, Dr. Bugay concluded that TWi's manufacturing process results in a

homogeneous matrix in its ANDA Product. Tr. 170:21-172:16 (Bugay Direct). Moreover, the inventors of the Patents-in-Suit stated during prosecution that "[o]ne of ordinary skill in the art would appreciate that the formulations derived according to the [manufacturing] protocol set forth in the Examples would necessarily comprise a homogeneous matrix." PTX 5.298; Tr. 567:5-19 (Little Direct). Example 4 in the '898 Patent sets forth a manufacturing process that involves blending and high shear granulation prior to tableting, as does TWi's manufacturing process. '898 Patent, col. 10, ll. 35-56.

For the foregoing reasons, based upon the testimony of Dr. Little and Dr. Bugay, as well as TWi's own representations as to the purposes of the various steps of its manufacturing process, the Court finds that TWi's manufacturing process results in a homogeneous matrix in the TWi Tablets.

FDA Uniformity Testing

Pursuant to FDA regulation, all pharmaceutical formulations must pass a series of uniformity tests, including blend uniformity, content uniformity, and dissolution testing, prior to being administered to humans or animals. See 21 C.F.R. § 211.110. These controls are required to "assure batch uniformity and integrity of drug products." Tr. 592:4-593:15 (Little Direct). The FDA has issued guidance, entitled "Powder Blends and Finished Dosage Units--Stratified In-Process Dosage

Unit Sampling and Assessment," "to assist manufacturers of human drug products in meeting the requirements of 21 C.F.R. § 211.110." Id. 596:3-16. This guidance explains that uniformity testing is required to "demonstrat[e] the adequacy of mixing to ensure uniformity of in-process powder blends and finished dosage units." Id. Additionally, the FDA also recommends that manufacturers "assess the uniformity of the powder blend, the in-process dosage units, and the finished product." Id. 597:8-598:3.

As required, TWi conducted blend and content uniformity tests and in vitro dissolution tests on its ANDA Product. [redacted] PDX 8 at 93:24-94:7, 96:2-5, 101:3-8 (S. Chen Dep.); PTX 364.14-16, 21; Tr. 599:25-600:2, 652:25-653:4, 659:1-2 (Little Direct). For the following reasons, the Court finds that the results of TWi's uniformity testing further demonstrate that the ANDA Product comprises a homogeneous matrix in which its constituents are uniformly dispersed.

Blend Uniformity Testing

Prior to receiving FDA approval, all pharmaceutical formulations must also pass blend uniformity testing. The FDA requires that blend uniformity testing be performed on all pharmaceutical formulations to ensure the adequacy of mixing. Specifically, the purpose of such testing is to verify that the

API is uniformly distributed throughout the final blend during the manufacturing process. Tr. 601:13-602:13 (Little Direct). Blend uniformity testing is performed prior to tableting and assesses the adequacy of mixing. This testing confirms the uniformity of all blended ingredients by determining whether samples from various locations within the blender contain the same amount of the API. Id. 595:6-13, 601:17-603:22.

While blend uniformity testing only directly measures the uniformity of the API, the results serve as a proxy for the uniformity of all ingredients, as the testing is designed to assess the adequacy of mixing. Id. 601:17-603:22. This concept is well-established in the literature. For example, the Journal of Drug Development and Industrial Pharmacy, a journal for which Dr. Elder serves on the editorial advisory board, published an article acknowledging that: "The homogeneity of a pharmaceutical blend is usually determined by assessing the uniformity of the active ingredient distribution throughout the mixture, while the uniformity of the excipients is assumed." DTX 9.3 (emphasis added). Dr. Little also persuasively testified that excipients that are not uniformly dispersed would result in a non-uniform distribution of the API, which would be apparent in the testing. His thorough and helpful explanation bears repeating:

> Q. Does blend uniformity testing have any relevance to ingredients within a tablet, other than the active ingredient, in your opinion?

> A. Yeah. This is a good question. So blend uniformity explicitly measures the active [ingredient], but it is understood that since you are mixing all of the rest of the ingredients alongside and in the same process as the active, that all the rest of those ingredients are mixed as well.
>
> Another way to think about this logically is that if you have, for instance, a heterogeneity in one of your excipients, that heterogeneity is going to take up space and is going to displace the active ingredient.
>
> So if you have a heterogeneity of an [excipient], you are going to have a heterogeneity in your API, or your active pharmaceutical ingredient.
>
> So all said, what's understood is that the blend uniformity measurement of the uniformity of the active is a proxy for the uniformity of the other excipients.
>
> Q. In your opinion, would a person of ordinary skill in the art view blend uniformity as applicable to all of the ingredients in a tablet?
>
> A. Yes.

Tr. 601:17-602:13 (Little Direct). The Court is persuaded that once the uniformity of oxcarbazepine has been established through blend uniformity testing, a person of ordinary skill in the art would assume that the inactive excipients are also uniformly dispersed.

Additionally, although blend uniformity testing assesses the adequacy of the blend, rather than the finished tablet, the properties of the blend "largely dictate the final product's properties." Id. 598:4-599:20. Indeed, Dr. Elder, TWi's expert, admitted that "blend uniformity testing is the first

in-process check to make sure that **the product** is uniform." Tr. 908:3-7 (Elder Cross) (emphasis added).

TWi conducted two sets of blend uniformity testing--one on the blend in the blender and the second on the blend in the drum--"to make sure that any blend uniformity observed in the blender carries through to the drum." PDX 8 at 92:10-14 (S. Chen Dep.). It is undisputed that TWi's ANDA Product passed FDA blend uniformity testing in both the blender and drum. Id. 91:18-92:14. As Dr. Little explained, the Court finds that this establishes that oxcarbazepine and the inactive excipients are uniformly dispersed in the blend. Furthermore, the Court is persuaded that the properties of the blend carry over to the final dosage unit. Accordingly, the Court finds that the results of TWi's blend uniformity tests establish that its ANDA Product comprises a homogeneous matrix in which the constituents are uniformly dispersed.

Content Uniformity Testing

TWi's ANDA product also passed the required content uniformity testing. PDX 8 at 96:2-5 (S. Chen Dep.). Whereas blend uniformity refers to the uniformity of the blend prior to tableting, content uniformity testing is conducted after the blend has been compressed into tablets. Content uniformity testing assesses whether each finished tablet contains the same amount of active ingredient. Dr. Little testified that

in-process dosage unit testing, such as content uniformity testing, "is an accurate and reflective measure of homogeneity of the product," which "account for potential segregation after blending." Tr. 653:25-654:20 (Little Direct). As with blend uniformity testing, the results of content uniformity testing serve as a direct proxy for the uniformity of all ingredients. Tr. 602:4-6, 653:25-654:20 (Little Direct). The Court is persuaded that the results of TWi's content uniformity testing also confirm that TWi's ANDA product comprises a matrix in which its constituents are uniformly dispersed.

***In Vitro* Dissolution Testing**

Finally, TWi performed in vitro dissolution tests on twelve tablets from each of its 150 mg, 300 mg, and 600 mg strengths. PTX 364.21; PTX 382; Tr. 658:1-7 (Little Direct). It is undisputed that the dissolution values for each of the TWi Tablets tested fell within the stated acceptance criteria for the in vitro dissolution tests. PTX 364:21; PTX 382; Tr. 657:7-660:21 (Little Direct); PDX 8 at 101:3-8 (S. Chen Dep.). Plaintiff contends that the results of TWi's in vitro dissolution tests further indicate that the TWi Tablets comprise a homogeneous matrix. For the following reasons, the Court agrees.

As Dr. Little testified, in vitro dissolution testing involves testing the final dosage form, i.e. the tablet,

and measuring the "drug coming out of the dosage form." Tr. 656:13-19 (Little Direct). Dr. Little further explained how in vitro dissolution testing serves as a proxy for homogeneity of the tablet matrix:

> Dissolution testing is where you take the final tablet, and this is typically the tablet that has even the coating on the outside of it, and you put it into a vial that has media. So you're putting it in high degradation conditions, dissolution testing conditions. And then what you're measuring is the drug coming out of the dosage form. Okay?
>
> So, the drug coming out of the dosage form is dependent on the drug and the solubility of the drug, and it's also heavily dependent on the excipients and the mixture of the excipients. So if you have a[n] inhomogeneity in either the API, active pharmaceutical ingredient, or the excipients, what you're going to see is that the tablets are going to sort of fall apart funny, and one will be different than another. So what you'll see is overall what I refer to as, and many people refer to as a dissolution profile which is the rate of dissolution over time, we'll see that in a minute, will be different from tablet to tablet. So that's why it gives you information about the uniformity of the product.

Id. 656:13-657:6. Stated differently, values within the stated acceptance criteria confirm that the TWi Tablets comprise a homogeneous matrix because, if there were heterogeneities in the distribution of oxcarbazepine or the excipients from tablet to tablet, the tested TWi Tablets would have fallen apart inconsistently and, thus, would not have consistent release profiles. As the results of TWi's in vitro dissolution tests demonstrate, the TWi Tablets exhibited the same release profiles, confirming that the tablets each comprise a

homogeneous matrix. Tr. 656:6-660:21 (Little Direct); PTX 382; PTX 364.21.

The results of TWi's in vitro dissolution tests show low variability between tablets, indicating that the TWi Tablets "performed uniformly" from tablet to tablet, as described by Dr. Little. Tr. 660:14-21 (Little Direct). Additionally, as Dr. Little testified, "nothing" in the in vitro dissolution test results "indicate[s] that there were heterogeneities in the system." Id. The Court is persuaded by Dr. Little's expert testimony that in vitro dissolution testing measures and confirms tablet matrix homogeneity by demonstrating that the TWi Tablets perform consistently with each other.

In sum, based upon the testimony and evidence presented at trial, the Court finds that the results of the FDA-required blend uniformity, content uniformity, and in vitro dissolution testing confirm that TWi's manufacturing process results in a uniform dispersion of ingredients and, therefore, establish that the TWi Tablets comprise a homogeneous matrix.

Raman Chemical Imaging

In further support of its position that the TWi Tablets comprise a homogeneous matrix, Supernus offers evidence of Raman chemical imaging of the TWi Tablets.[7] Dr. Bugay testified at

[7] Supernus contends that Raman chemical images is "not necessary to assess matrix homogeneity," but that "a POSA could

length regarding the Raman imaging tests he performed on the TWi Tablets, as well as the Oxtellar XR® tablets, and his conclusions regarding the presence of a homogeneous matrix.

Dr. Bugay first microtomed and analyzed a 600 mg TWi Tablet. To prepare the sample, Dr. Bugay mounted the sample tablet and performed microtomy to expose a flat, interior surface of the tablet for analysis. Tr. 155:19-157:5 (Bugay Direct). Dr. Bugay explained that he was able to qualitatively (i.e. non-statistically) analyze the homogeneity of the ANDA Product based on a single slice of one tablet because TWi uses a standard high-shear wet granulation manufacturing process and the TWi Tablets passed FDA uniformity testing. Id. 170:21-173:3, 174:14-25. Next, Dr. Bugay performed Raman spectroscopy to identify the different constituents present in the sample tablet surface based upon the constituents' distinct vibrational frequencies and resultant spectra when irradiated with a beam of monochromatic light. Id. 157:7-158:14. Each constituent's Raman spectrum is like a "fingerprint," which is unique to the particular constituent. This allowed Dr. Bugay to compare the spectra he obtained from the sample TWi Tablet to individual reference spectra that he collected from standard samples of

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also confirm homogeneity by conducting Raman chemical imaging experiments." Pl. PFOF ¶ 97 [Docket No. 273] (citing Tr. 152:6-153:5 (Bugay Direct)). The Court agrees.

each ingredient, in order to identify the different components on the sample surface. Id.

Dr. Bugay then repeated this procedure for more than 35,000 data points, covering over 70% of the tablet's surface. Id. 158:15-168:7. By processing and compiling thousands of data points, Dr. Bugay created color-coded Raman chemical images that indicate both the presence and location of the various constituents in the tablet sample. Id. 164:2-165:9. Dr. Bugay then confirmed this data using extensive validation procedures. Id. 168:20-170:17. Dr. Bugay credibly testified that a person of ordinary skill in the art would know that homogeneity must be assessed, in the context of the Patents-in-Suit, at the scale of the tablet as a whole. Id. 153:19-154:2. Dr. Little confirmed that a person of skill in the art would understand that the proper scale of scrutiny in this context is at the level of the tablet. Tr. 931:10-21 (Little Direct). Given the relevant scale of scrutiny identified in the asserted claims in the Patents-in-Suit, the Court believes that Dr. Bugay's Raman chemical images properly assess the vast majority of the tablet surface.

Dr. Bugay created the following Raman chemical images of the sample TWi Tablet, which show the presence of [redacted]

[redacted]

Claim Element	Ingredient(s) in TWi's Tablets	Chemical Image Showing Uniform Dispersion
1(a): "oxcarbazepine"	[redacted]	
1(b): "matrix-forming polymer"		
1(c): "at least one agent that enhances the solubility of oxcarbazepine"		
1(d): "at least one release promoting agent"		
1(d): "at least one release promoting agent"		

Tr. 165:10-158:10 (Bugay Direct); PTX 246:3-14.

Based upon his visual analysis of the Raman chemical images, Dr. Bugay concluded that each of the constituents in the sample TWi Tablet is uniformly dispersed throughout the tablet and, therefore, that the TWi tablet comprises a homogeneous matrix. Tr. 164:1-168:19 (Bugay Direct); Tr. 660:22-662:6 (Little Direct). As evidenced by the Raman chemical images of the sample TWi Tablet, the constituents are not localized in one area of the tablet surface alone, but rather are found

throughout the tablet surface. Dr. Bugay persuasively testified that a person of ordinary skill in the art would not expect to obtain perfect molecular uniformity using standard high-shear wet granulation processes. Tr. 154:3-15 (Bugay Direct). Instead, he explained, such a person would understand that a lack of localization of excipients across the tablet matrix indicates that the matrix constituents are homogeneous and uniformly dispersed. Id. 165:10-168:10; PTX 246.3-14; Tr. 661:9-662:6 (Little Direct). Dr. Bugay testified that a person of ordinary skill in the art would not "require that a matrix be perfectly molecularly uniform in order to qualify as a homogeneous matrix in the context of [the Patents-in-Suit] and specifically this Court's construction of 'homogeneous matrix.'" Tr. 154:3-8 (Bugay Direct). He elaborated:

> I would not expect that a perfect homogeneous matrix such as how a mason builds a sidewalk in a herringbone pattern or builds a brick wall with the bricks in exact orientation and such. Our pharmaceutical procedures don't get down to that level of precision, okay, so it wouldn't be the perfect homogeneity, yet we are able to easily discern as to whether a homogeneous matrix exists or not for that particular tablet.

Id. 154:8-15.

Moreover, Dr. Little reviewed Dr. Bugay's Raman chemical images and agreed with Dr. Bugay's determination that the images confirm the presence of a homogeneous matrix in the sample TWi Tablet. Tr. 661:9-662:6 (Little Direct). Dr. Little reiterated

that matrix homogeneity in this context is measured by lack of localization of any excipient, testifying that the Raman chemical images verify that the ANDA Product comprises a homogeneous matrix because there is no localization of any of the excipients. Id. at 661:23-662:6. Specifically, he testified regarding the Raman chemical images of the TWi Tablet as follows:

> And what I observed in these [Raman chemical images] is that the results that we see here [are] not surprising at all because these were made by high-shear wet granulation. So, what you would see is that all these excipients that are listed here are mixed up in the tablet, so you can just see that's the case. There's not a particular excipient that is located in one particular location, like a coating or a bilayer or a core or something like that. What this confirms is that these are homogeneous matrix tablets.

Id. In Dr. Little's expert opinion, this lack of localization is not only the expected result of TWi's high-shear wet granulation manufacturing process, but also establishes that each TWi Tablet comprises a matrix in which all of the constituents are uniformly dispersed.

Based upon his assessment of the 600 mg TWi Tablet, Dr. Bugay concluded, in his expert opinion, that the 150 mg and 300 mg TWi Tablets also comprise homogeneous matrices in which all the constituents are uniformly dispersed since each tablet is created through the same manufacturing process. Tr. 170:21-173:3, 174:14-25 (Bugay Direct). The only difference is in the

amount of each constituent. This does not affect the homogeneity of the tablets. Id. 174:14-25. Additionally, as Dr. Little and Dr. Bugay testified, the objective of any formulator creating a standard pharmaceutical formulation is to achieve a homogeneous matrix. See, e.g., id. 170:21-172:16; Tr. 590:2-16 (Little Direct).

TWi levels two main critiques against Dr. Bugay's testimony. First, TWi claims that "[i]t is undisputed that Dr. Bugay tested expired samples of TWi's product," which "calls the testing into question, as it was not conducted on the actual product TWi will sell, because FDA regulations do not permit the sale of expired product." Def. Br. at 44 n.7 [Docket No. 275]. Yet, the TWi Tablets do not currently have an expiration date approved by the FDA, but merely a proposed expiration date based only upon accelerated stability studies, which may be extended by the FDA after review of TWi's full-term stability data. Tr. 241:15-243:6 (Bugay Redirect). In any event, Dr. Bugay credibly testified that he did not observe any evidence of degradation or impurities in the sample TWi Tablet that would have impacted the accuracy of his Raman chemical images. Tr. 213:13-17, 217:5-9 (Bugay Cross); 243:10-244:11 (Bugay Redirect). He further testified that any degradation or impurities in the sample TWi Tablet would have been readily apparent to him when he conducted his Raman chemical imaging.

Tr. 213:13-17 (Bugay Cross); Tr. 243:15-21 (Bugay Redirect). At this stage, the TWi Tablets are only subject to a proposed expiration date. There is no evidence that the TWi Tablet tested by Dr. Bugay was not representative of the TWi Tablets that TWi submitted to the FDA for approval and that TWi intends to market. More importantly, there is simply no evidence in the record that Dr. Bugay's analysis was impaired, altered, or otherwise inaccurate because he tested a sample tablet beyond its proposed expiration date. Accordingly, the Court finds that Dr. Bugay's Raman chemical images are relevant to its infringement determination. Moreover, the Court finds no reason to discredit Dr. Bugay's analyses or conclusions simply because the sample tablet may have been tested beyond its proposed expiration date.

Second, TWi argues that the Raman chemical images of the TWi Tablet do not establish that the constituents are uniformly dispersed because Dr. Bugay assessed only the relative concentration of the constituents in the sample TWi Tablet, as opposed to the absolute concentration or quantity of the constituents. According to TWi's expert witness, Dr. Elder, Dr. Bugay's Raman chemical images do not establish that the TWi Tablet tested comprises a homogeneous matrix in which its constituents are uniformly dispersed "because the images do not provide an absolute concentration of the active -- or any of the

ingredients in that evaluation, the images do not quantitatively describe the ingredients that are being measured" and "[i]t's not possible to determine uniformity without determining the concentration[.]" Tr. 860:6-10 (Elder Direct). In other words, Dr. Elder opined that Dr. Bugay's qualitative analysis was inappropriate for assessing homogeneity and that a quantitative analysis should have been undertaken. Id. 861:5-14. Despite this testimony, Dr. Elder did not perform any testing in connection with this litigation. Tr. 869:9-10 (Elder Cross).

Dr. Bugay agrees that his Raman chemical analysis was a qualitative study; however, he credibly testified that, in his expert opinion, a quantitative analysis is not necessary to determine whether the matrix constituents in the TWi Tablet are uniformly dispersed or localized in a discrete area of the tablet. Tr. 165:10-23 (Bugay Direct); Tr. 222:10-14, 223:8-224:4 (Bugay Cross). He further testified that "quantitative presentation of chemical images is very rare" and is "not routinely performed at all by spectroscopists as [him]self in the industry." Tr. 223:13-19 (Bugay Cross). This was confirmed by Dr. Elder, who testified that he has only performed one "semi-quantitative" Raman chemical analysis in his thirty years' of experience in this field. Tr. 869:12-870:1 (Elder Cross) (emphasis added). Having considered the testimony of Dr. Bugay and Dr. Elder on this issue, the Court finds no reason to

discredit Dr. Bugay's qualitative chemical imaging or the conclusions drawn from it. The record simply does not support a finding that a qualitative Raman chemical analysis is inappropriate for assessing or confirming the homogeneity of the tablet matrix or that a quantitative analysis should have been performed. The Court is persuaded by Dr. Bugay's testimony that quantitative Raman chemical analyses are rarely, if ever, used by persons of ordinary skill in the art and that his Raman chemical imaging confirms that the constituents of the sample TWi Tablet are uniformly dispersed across the tablet matrix.

Having considered Dr. Bugay's testimony, as well as the Raman chemical images of the sample TWi Tablet, and having rejected TWi's critiques of Dr. Bugay's analyses and conclusions, the Court concludes that the Raman chemical images of the sample TWi Tablet confirm that TWi's ANDA Product comprises a homogeneous matrix. In sum, based upon TWi's manufacturing process, the results of the FDA uniformity testing on the TWi Tablets, and the Raman chemical imaging of the sample TWi Tablet, the Court finds that the TWi Tablets comprise a homogeneous matrix, as construed by this Court and as understood by a person of ordinary skill in the art.

(b) Agent that Enhances the Solubility of Oxcarbazepine

Supernus contends that [redacted] in the TWi Tablets satisfies element 1(c) of claim 1 of the Patents-in-Suit. Claim element 1(c) of the '898 and '131 Patents requires "at least one agent that enhances the solubility of oxcarbazepine selected from the group consisting of surface active agents, complexing agents, cyclodextrins, pH modifying agents, and hydration promoting agents." Claim element 1(c) of the '930 Patent requires "1-80%, by weight of the formulation, at least one agent that enhances the solubility of oxcarbazepine." [redacted] Tr. 353:23-354:8, 365:1-6 (Berkland Direct).

To establish whether [redacted] is an agent that enhances the solubility of oxcarbazepine, Dr. Leonard Chyall, Supernus's expert in analytical testing of pharmaceutical compositions, performed solubility tests on oxcarbazepine in the presence of [redacted]. Tr. 250:11-251:4 (Chyall Direct). He did not perform solubility or dissolution tests on the TWi Tablets themselves. Dr. Chyall employed the shake-flask test in his solubility studies, an industry standard method, which he described as "the most reliable and widely used method for solubility measurement today." Id. 252:14-19. His testing

protocol tracked the solubility testing protocol set forth in Example 3 of the Patents-in-Suit. Id. 251:10-19. In performing the solubility testing, Dr. Chyall prepared four solutions with varying percent concentrations of [redacted] to assess how the presence of [redacted] impacted the solubility of oxcarbazepine. The various solutions included a control solution with [redacted]. Id. 253:4-254:5. Dr. Chyall added crystalline oxcarbazepine to the various solutions. The samples were then shaken to facilitate dissolution of the oxcarbazepine crystals into the solution. Id. 254:6-255:11. Thereafter, Dr. Chyall separated the undissolved solid oxcarbazepine from the solutions, first using centrifugation and then filtration through a 0.2 micron filter. Id. 255:12-257:1. Due to the high viscosity of the 10% [redacted] solution, Dr. Chyall was unable to obtain results from this sample. Id. 261:21-262:2. This, however, did not affect his ability to form and offer an opinion as to whether [redacted] enhances the solubility of oxcarbazepine. Id. 262:3-7.

Dr. Chyall's solubility testing presented the following results:

[8] TWi also conducted internal solubility tests, using the shake-flask method and modeled after the test protocol in Example 3 of the Patents-in-Suit. The results of these tests were the subject of a motion to compel, which was granted by Magistrate Judge Schneider. June 21, 2016 Order [Docket No. 117]. Magistrate Judge Schneider determined that the documents in question were not protected by the attorney-client privilege or work-product doctrine. In ordering production of the test results, Magistrate Judge Schneider reasoned that "Defendant's tests were not primarily prepared for the purpose of rendering legal advice or preparing for anticipated litigation." Id. at 5. Instead, "the purpose of defendant's tests was to conduct research and development in order to assist TWi to prepare and file its ANDA, and to decide what ingredients to use." Id. TWi appealed that determination to this Court [Docket No. 124]. After a timely objection is made, the district judge must set aside any portion of a magistrate judge's order that is "clearly erroneous or is contrary to law." Fed. R. Civ. P. 72(a); D.N.J. L. Civ. R. 72.1(c)(1). Having considered the parties' written and oral submissions, as well as the documents in question, the Court does not find Magistrate Judge Schneider's determination to be clearly erroneous or contrary to law. Indeed, this Court agrees with Magistrate

The results of Dr. Chyall's tests show that the solubility of oxcarbazepine increased from an average of 0.0521 mg/mL in the control solution to an average of 0.66498 mg/mL in the 1% [redacted] solution and an average of 0.1554 mg/mL in the 5% [redacted] solution. These values demonstrate an average 26% increase in the solubility of oxcarbazepine in the 1% [redacted] solution versus the control solution and an average 195% increase in the solubility of oxcarbazepine in the 5% [redacted] solution versus the control solution. PTX 259.2. Clearly, Dr. Chyall's solubility test results indicate that as the concentration of [redacted] increases, so does the solubility of oxcarbazepine. PTX 259.2; Tr. 270:19-24 (Chyall Direct).

TWi apparently does not dispute that Dr. Chyall's solubility testing demonstrates an increase in the solubility of

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Judge Schneider that the solubility tests were conducted for purposes other than seeking legal advice or in anticipation of litigation and were instead a necessary part of TWi's process of formulating its ANDA Product. That counsel was involved in planning TWi's tests does not render the underlying test results undiscoverable.

Nevertheless, the Court need not rely upon the results of these tests in determining that the TWi Tablets contain an element 1(c) solubility enhancer in the form of [redacted] That being said, the Court observes that the results of these tests also demonstrated an increase in the solubility of oxcarbazepine in the presence of [redacted], the same grade of [redacted] as used in the TWi Tablets manufactured by a different brand, as opposed to in a [redacted] control solution. See PTX 269.95; PTX 228.

oxcarbazepine in the presence of [redacted]. See Def. PFOF ¶ 173 [Docket No. 275-1]. Rather, TWi argues that such minor increases in solubility are insignificant and insufficient to establish that [redacted] is an agent that enhances the solubility of oxcarbazepine. The Court disagrees. Dr. Chyall testified that he performed statistical analyses on his solubility testing results and that he concluded, based upon these analyses, that the increase in solubility evidenced by his tests is statistically significant. Tr. 270:4-17 (Chyall Direct). Additionally, as Supernus correctly points out, there is simply nothing in the Patents-in-Suit that requires an ingredient to increase the solubility of oxcarbazepine by a particular amount or percentage before it is considered an "agent that enhances the solubility of oxcarbazepine," as claimed in element 1(c).

In challenging Dr. Chyall's opinions, TWi presents the testing and opinions of Dr. Cory Berkland, an expert in the field of pharmaceutical formulations and particulates, who independently conducted shake-flask testing to assess the solubility of oxcarbazepine in various [redacted]solutions. Like Dr. Chyall, Dr. Berkland also prepared solutions with varying percent concentrations of [redacted], added solid crystalline oxcarbazepine to the samples, separated the solid oxcarbazepine particles from the solutions using centrifugation and filtration

through a 0.22 micron filter, and then measured the solubility of oxcarbazepine in the different solutions. DTX 46.1, 8-11. Each value obtained by Dr. Berkland established that the solubility of oxcarbazepine increased as the percent concentration of [redacted] increased. Id.

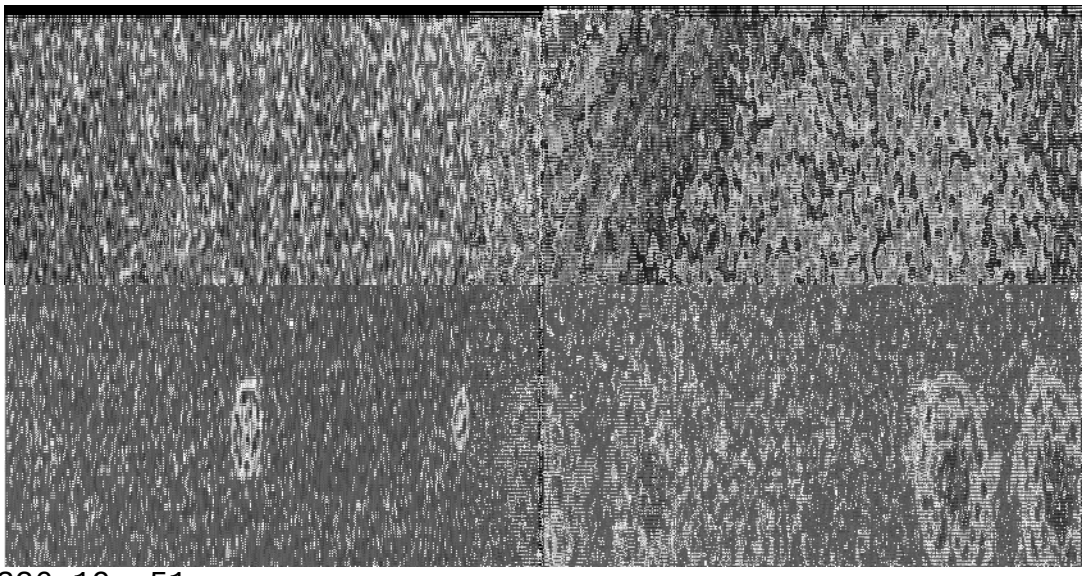
Despite such findings and despite having independently employed the same shake-flask testing method as Dr. Chyall to assess solubility, see Tr. 423:2-7 (Berkland Direct), at trial, Dr. Berkland testified that the results of Dr. Chyall's shake-flask solubility tests were flawed and inaccurate. According to Dr. Berkland, Dr. Chyall's results overestimated the increase in the solubility of oxcarbazepine because they did not account for increases caused by undissolved solid oxcarbazepine particles that may have passed through the filter. Id. 380:1-382:25, 484:17-485:13. He explained that "removing solid substances from a viscous solution becomes difficult and more difficult as the viscosity increases." Id. 386:1-9. Dr. Berkland attributed this concept to Stokes' Law, which he described as a law of nature that explains how a particle will settle out of a liquid. Id. 387:2-389:15. Due to Stokes' Law, Dr. Berkland testified, solid crystalline oxcarbazepine particles may remain suspended in the viscous [redacted] solution and, if small enough, may pass through the filter. This results in artificially inflated solubility results because solubility testing only measures the

presence of oxcarbazepine in the filtered solution, but does not differentiate between dissolved oxcarbazepine and solid oxcarbazepine that has inadvertently passed through the filter. Id. 381:21-382:25.

Dr. Chyall, however, was undeterred by such criticisms. As a preliminary matter, Dr. Chyall testified that the high viscosity of a solution creates obstacles in shake-flask testing when the solid particles are separated from the solution using centrifugation only. Tr. 328:21-23, 332:24-333:10 (Chyall Cross). Yet both Dr. Chyall and Dr. Berkland removed solid oxcarbazepine particles from their test solutions by centrifugation and filtration. Id. 332:24-333:10; DTX 46.4. Additionally, Dr. Chyall performed particle size distribution testing and confirmed that the oxcarbazepine tested by Dr. Berkland did not contain particles small enough to pass through the 0.22 micron filter utilized in his shake-flask experiments. PTX 280.11; Tr. 290:21-292:2 (Chyall Direct). Likewise, Dr. Chyall did not begin his experiments with sufficient oxcarbazepine particles small enough to fit through the filter to artificially inflate his results. Tr. 289:14-290:7 (Chyall Direct). Indeed, Dr. Chyall credibly opined that billions of nano-sized solid oxcarbazepine particles would have had to inadvertently pass through his filter to account for the increased solubility demonstrated by his test results.

Tr. 311:20-312:7 (Chyall Cross). There is simply no evidence that even suggests that this occurred.

In further support of its criticisms of Dr. Chyall's findings, TWi offers transmission electron microscopy ("TEM") images of Dr. Berkland's filtered solutions. After performing the shake-flask solubility experiments, Dr. Berkland created TEM images of the filtered solutions. PTX 326. According to Dr. Berkland, the TEM images establish the presence of undissolved solid crystalline oxcarbazepine particles in the filtered solution. Tr. 472:18-475:13, 476:1-19, 477:9-478:1 (Berkland Direct). Representative examples of Dr. Berkland's TEM images follow:



PTX 326.19, 51.

The Court remains unconvinced. As Supernus correctly notes, there is simply no credible evidence in the record that establishes that the structures in the TEM images are in fact

undissolved solid crystalline oxcarbazepine particles. Importantly, Dr. Berkland did not perform any chemical analysis or testing to confirm that the particles in the TEM images were indeed solid oxcarbazepine particles. Tr. 710:20-711:13 (Little Direct); Tr. 783:11-784:2 (Little Redirect). More perplexingly, Dr. Berkland did not prepare any control TEM images of solutions with known solid oxcarbazepine to confirm that the TEM images of the filtered solutions actually displayed undissolved oxcarbazepine. Tr. 711:10-21 (Little Direct). Furthermore, in Dr. Little's opinion, the perfectly spherical or ovular particles in Dr. Berkland's TEM images are inconsistent with solid crystalline particles, which have angular or faceted edges. Id. 709:22-717:23; see also Tr. 521:14-20 (Berkland Cross). Finally, certain particles in the TEM images created by Dr. Berkland are well over 0.22 microns in diameter, meaning that, if they were in fact solid oxcarbazepine particles as TWi contends, they would not have been able to pass through the 0.22 micron filter used by Dr. Berkland. See, e.g., Id. 513:20-514:8; PTX 326.3; PTX 326.35.

The Court finds that Dr. Chyall's solubility tests and testimony demonstrate that [redacted] is an agent that enhances the solubility of oxcarbazepine. The Court is simply not persuaded by Dr. Berkland's critique of Dr. Chyall's solubility test results. Critically, after a colloquy with this

Court, Dr. Berkland admitted that his testimony was limited to critiquing Dr. Chyall's methodology and conclusions, but that he could not independently opine that [redacted] does not enhance the solubility of oxcarbazepine. Tr. 501:15-22 (Berkland Cross). Furthermore, there is no credible evidence that undissolved solid oxcarbazepine passed through the filter in either Dr. Chyall or Dr. Berkland's shake-flask solubility tests. Even if some amount of undissolved oxcarbazepine was inadvertently counted in the solubility values, the Court is persuaded by Dr. Chyall's testimony that "over 10 billion" improperly counted solid oxcarbazepine particles would have been needed to create the increase solubility documented by his studies. Tr. 311:23-312:7 (Chyall Cross). As the Court previously stated, there is no evidence whatsoever to support such massive numbers of undissolved particles passing through the filter. Accordingly, the Court finds that the results of the shake-flask solubility experiments performed by both Dr. Chyall and Dr. Berkland establish that [redacted] is an agent that enhances the solubility of oxcarbazepine.

Dr. Little, relying in part on Dr. Chyall's solubility testing, also concluded that [redacted] acts as an agent that enhances the solubility of oxcarbazepine in the TWi Tablets. Tr. 662:15-663:7, 733:16-734:3 (Little Direct). He also relied upon the claims and specifications of the Supernus

Patents, the prosecution history, peer-reviewed literature, product literature for [redacted], as well as for other grades and brands of povidone, and TWi's manufacturing and batch records to come to this conclusion. Id. 662:15-663:7.

A reading of the specifications supports this conclusion. The specifications state that the "[s]olubilizers preferred in this invention include . . . complexing agents such as low molecular weight [redacted] . . . ." '898 Patent, col. 5, ll. 9-15. Thus, it is clear that the Patents-in-Suit contemplate [redacted] the generic molecular term for [redacted] as a solubilizer. The fact that the "preferred" solubilizer is a low molecular form of [redacted] is immaterial, as nothing in the Patents-in-Suit or the specifications limits the solubilizers to the "preferred" low molecular weight grades. Tr. 666:14-669:8 (Little Direct); see also '898 Patent, col. 8, ll. 46-49. Indeed, Dr. Little explained that, based upon his review of the relevant scientific literature, high molecular weight [redacted] may be an even more suitable solubilizer because it complexes more efficiently than low molecular weight [redacted] Tr. 681:11-684:25, 704:22-705:12 (Little Direct). TWi's expert, Dr. Berkland, likewise conceded that "it's not to say that the higher molecular weight [redacted] would have no utility in enhancing

the solubility" of oxcarbazepine. Tr. 370:24-371:5 (Berkland Direct).[9]

Similarly, the prosecution history confirms the understanding in the art that [redacted] is considered an agent that enhances the solubility of drugs such as oxcarbazepine. For example, during prosecution of the Patents-in-Suit, the Examiner observed that a prior art reference disclosed a formulation comprising a homogeneous matrix comprising "[redacted] (a surface active agent; at least one agent that enhances the solubility of oxcarbazepine; that polyvinylpyrrolidone is known in the art as a surface active agent, ...)." PTX 5.385.

[9] TWi argues that the Patents-in-Suit describe formulations with certain grades of povidone as lacking a "solubility enhancer." The Court agrees with Supernus that this argument is disingenuous. This Court considered and squarely rejected similar arguments in the Actavis Matter and, based upon the record and arguments developed in this litigation, reiterates that rejection here. Table 1 of the Patents-in-Suit recites the composition of three "non-enhanced" oxcarbazepine formulations that contain "no solubility/release enhancer," referring to the "combination of solubility and release promoters [that] is contemplated in this invention." '898 Patent, col. 2, ll. 60-62, col. 9, ll. 11-37; id. col. 4, ll. 14-16 (emphasis added). Only the CR-M formulation contains [redacted], in the form of [redacted]. None of the non-enhanced formulations contain a release promoter, hence the description "no solubility/release enhancer." Additionally, Table 4 lists the compositions of an enhanced and a non-enhanced formulation. Id. col. 10, l. 56—col. 11, l. 15. While the non-enhanced formulation is described in the Patents-in-Suit as "without solubility enhancer," [redacted], the grade of [redacted] used in the TWi Tablets, is not present in either formulation described in Table 4. Id. col. 3, ll. 14-17. The language of the Patents-in-Suit clearly does not describe any formulation containing [redacted] as "without solubility enhancer."

Moreover, based upon the relevant scientific literature and product materials, it is evident that [redacted] used in the TWi Tablets, is known in the art as an agent that enhances the solubility of poorly soluble drugs. For example, Dr. Little testified that Remington's Essential Pharmaceuticals, a reputable treatise upon which he relied in forming his opinions, explains that [redacted] "can enhance aqueous solubility of drugs through the formation of water-soluble complexes and [be] used as solubility and dissolution enhancers." Tr. 685:10-686:8 (Little Direct). The treatise does not distinguish between high and low molecular weight [redacted]. Id. 686:4-6. Likewise, The Handbook of Pharmaceutical Excipients, also a well-respected treatise relied upon by Dr. Little, states that "[redacted] is used as a solubilizer in oral and parenteral formulations and has been shown to enhance dissolution of poorly soluble drugs from solid dosage forms." Id. 723:10-725:5. Finally, Dr. Little identified Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems as a reputable treatise upon which he relied in concluding that high molecular weight [redacted] increases the solubility of poorly soluble drugs. This treatise explains that "[redacted] at the higher molecular weights can be used to prepare gels and concentrations up to about 10 percent, it has the advantage of being compatible

in solution with a wide range of inorganic salts, natural and synthetic resins, and other chemicals. It has been used to increase the solubility of a number of poorly soluble drugs." Id. 677:11-678:23.

The product informational and advertising materials for [redacted] offered at trial also establish that [redacted] is known in the art as a solubility enhancer. At trial, Dr. Little testified regarding product materials created by [redacted], the manufacturer of [redacted], used in the TWi Tablets, and by BASF, the manufacturer of [redacted], another brand of [redacted]. The [redacted] product materials state that its "[redacted] improve the solubility and enhance bioavailability of APIs", "can improve the solubility of a drug through co-mixing, co-melting or co-precipitation to form solid dispersions", and "have been shown to enhance the solubility of actives." DTX 64.1, 4. Dr. Little reviewed the [redacted] product overview and understands these statements to describe all grades and weights of [redacted]. Tr. 694:3-695:3 (Little Direct).

Like [redacted] BASF manufactures [redacted] under the brand name [redacted].[10] In its product materials, BASF describes

[10] The Court is persuaded that [redacted] are merely different brands of the same molecule and, therefore, that materials and testing regarding [redacted] are also applicable to [redacted]. Dr. Little thoroughly explained that [redacted] are both USP grades of [redacted] of a particular molecular weight. In other

[redacted] as a "complexing agent," "dissolution enhancer," and "solubilizing agent" used to "improv[e] dissolution." Id. 697:11-698:4, 698:22-699:5. Dr. Little reviewed both the [redacted] and BASF product materials and cogently testified that these materials further confirm his opinion that [redacted] is an agent that enhances the solubility of oxcarbazepine in the TWi Tablets. Id. 693:1-695:22, 698:18-699:16.

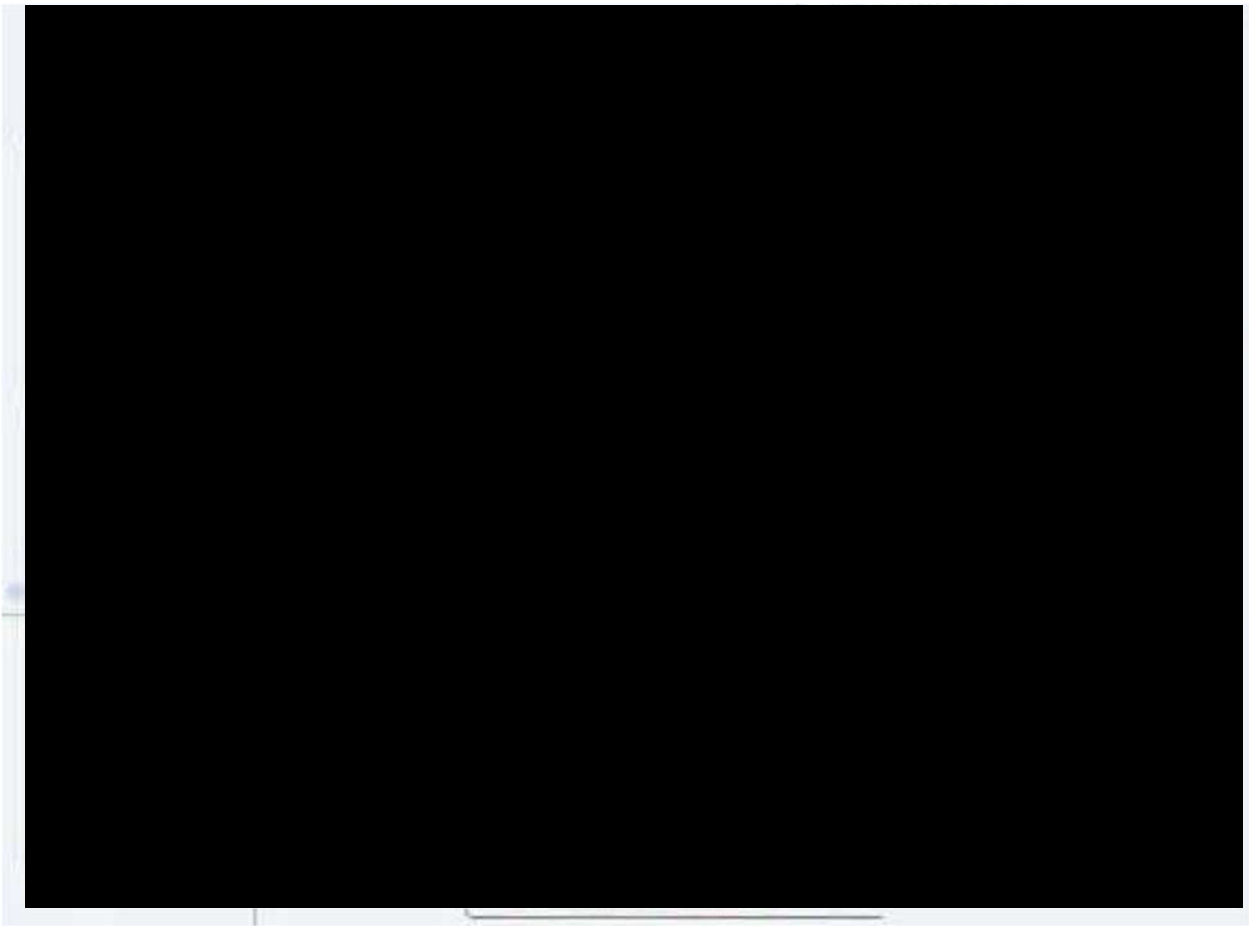
Indeed, this conclusion is further substantiated by TWi's own internal formulation document. At trial, Supernus introduced a chart created by TWi formulator James Chen that documents various experimental formulations tested by TWi in developing its ANDA product and the results of removing or adding certain excipients. PTX 146(A). The chart uses the following legend to identify experimental formulations that were a "not reliable/dead end" or resulted in "good info":

According to the document, [redacted]

words, the two are simply the same molecule, i.e. compounds having identical chemical structures, manufactured by different companies. See, e.g., Tr. 671:6-672:8, 675:15-676:11 (Little Direct).

[redacted]

[redacted]



Id. Mr. Chen's deposition testimony regarding the meaning of his comments was unhelpful. Having had the opportunity to observe and listen to Mr. Chen's videotaped deposition testimony during trial, on balance, the Court does not find Mr. Chen's testimony to be credible. His demeanor and responses were evasive and vague. The sum and substance of his testimony was that he had no recollection of why he wrote [redacted] or what he meant by it. PDX 9 at 70:24-72:10 (J. Chen Dep.).

At trial, TWi's counsel urged this Court to find that TWi's use of [redacted] was "extraordinarily routine" and that it was "employed in the most routine possible way," namely, as a [redacted]. Tr. 609:21-610:2. And, indeed, TWi identified [redacted] in its ANDA. PTX 88.11-12; PTX 364.2. Yet there is no actual evidence in the record from TWi formulators or employees that [redacted] was selected for this "routine" purpose only.[11] Rather, TWi merely presents

[11] Though the FDA asks applicants to explain how "the excipients and their grades" were selected, TWi did not address why the particular grade of [redacted] was selected. PTX 88.11-12 (emphasis added). Dr. Shou-chiung Chen, TWi's Rule 30(b)(6) corporate representative, testified at her deposition that TWi did not answer the latter part of this question because it did not believe that it was necessary to respond to all of the FDA's questions in detail. See PDX 8 at 80:22-84:06 (S. Chen Dep.). When directly asked how the specific grade of [redacted] was selected, Dr. Chen invoked the attorney-client privilege and did not answer. She did, however, testify that she could have answered the question but for her attorney's instruction not to answer. Id. 81:25-82:7.

The parties submitted briefing as to whether the Court may draw an adverse inference from TWi's invocation of the attorney-client privilege with regard to the selection of [redacted]. TWi simultaneously seeks to withhold its reasons for selecting [redacted] as privileged, while urging the Court that [redacted] was selected due to its routine function as a [redacted]. The Court cannot fathom why the purported selection of a routine [redacted] for its routine purpose would be privileged. In other words, it is hard to understand TWi's caginess on the issue if it simply selected [redacted] as a routine [redacted]. The mere involvement of counsel in the selection of an excipient does not permit TWi to invoke the privilege as both a sword and a shield. While this Court is tempted to draw an adverse inference from such tactical invocation of the attorney-client privilege, see Regeneron Pharm., Inc. v. Merus N.V., --- F.3d ----, 2017 WL 3184400, at *17 (Fed. Cir. July 27, 2017), the Court declines to do so given the ample evidence to establish that [redacted] serves as an agent

attorney argument for this proposition. Clearly, TWi's characterization of [redacted] does not mean that it cannot and does not serve more than one function. Tr. 564:11-14 (Little Direct); see also Tr. 137:9-23 (Bhatt Cross).[12] The only credible evidence before this Court as to

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that enhances the solubility of oxcarbazepine in TWi's ANDA Product.

The Court makes no finding as to the propriety of Dr. Chen's invocation of the attorney-client privilege and draws no adverse inferences from such invocation. Nonetheless, the fact of the matter is Dr. Chen did not testify under oath as to the reason why TWi selected the particular grade of [redacted] for use in its ANDA Product. TWi, in essence, urges the Court to infer from her silence that TWi selected [redacted] for its routine function as a [redacted] and for no other reason. The Court declines to do so.

[12] TWi moved in limine to preclude the testimony of Dr. Bhatt as irrelevant to any issue in the litigation [Docket No. 227] or, in the alternative, as improperly undisclosed expert testimony [Docket No. 225]. The Court denied both motions [Docket No. 242]. The Court outright rejects TWi's contention that Dr. Bhatt's testimony must be excluded as irrelevant. Dr. Bhatt, a named inventor on the Patents-in-Suit, testified at trial regarding the development and formulation of the patented invention, as well as the background of the Patents-in-Suit. The Court finds such testimony to be relevant to the issues to be determined in this case and relies upon Dr. Bhatt's testimony as appropriate in making its findings of fact and conclusions of law. The Court also rejects TWi's attempt to characterize Dr. Bhatt's testimony as undisclosed expert testimony. He was neither proffered as an expert by Supernus nor admitted to testify as an expert at trial. He did not provide expert testimony. Instead, he properly testified as to matters which, while technical and specialized, are squarely within his particularized firsthand knowledge and experience as a pharmaceutical scientist employed by Supernus and as an inventor on the Patents-in-Suit. Donlin v. Philips Lightning N. Am. Corp., 581 F.3d 73, 81 (3d Cir. 2009) ("When a lay witness has particularized knowledge by virtue of her experience, she may testify--even if the subject matter is

this issue is the chart created by TWi formulator Mr. Chen, observing "[redacted]." PTX 146(A). Thus, while [redacted] may indeed act as a [redacted] in the TWi Tablets, this document confirms that [redacted] also functions as an agent that enhances the solubility of oxcarbazepine by facilitating hydration in the TWi Tablets.

For the foregoing reasons, the Court finds that [redacted] is an agent that enhances the solubility of oxcarbazepine. Accordingly, the Court now examines whether [redacted] is a solubility enhancer "selected from the group consisting of surface active agents, complexing agents, cyclodextrins, pH modifying agents, and hydration promoting agents," as required by claim 1 of the '898 and '131 Patents. Dr. Little cogently testified that all grades of [redacted] have surface active properties, making [redacted] a surface active agent, also known as a surfactant. Tr. 663:22-664:3, 692:16-693:24, 722:10-723:9 (Little Direct). Even Dr. Berkland characterized [redacted] as a "hydrophilic surfactant." Tr. 540:23-25 (Berkland Cross). The [redacted] product brochure and the Patent Office Examiner likewise confirm that [redacted] is a surface

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specialized or technical--because the testimony is based upon the layperson's personal knowledge rather than on specialized knowledge within the scope of [Federal Rule of Evidence] 702."); see also Fed. R. Evid. 701 Advisory Committee Notes. Accordingly, the Court finds that there is no justification for excluding Dr. Bhatt's testimony.

active agent. Tr. 692:16-693:24 (Little Direct); PTX 5.385 (describing [redacted] as a "surface active agent; at least one agent that enhances the solubility of oxcarbazepine.").

The evidence presented at trial also establishes that [redacted] is a complexing agent. Dr. Little identified numerous items in the scientific literature that characterize [redacted] as a complexing agent. For example, an article relied upon by Dr. Berkland, entitled "[redacted] Excipients for the Pharmaceutical Industry," explains that [redacted] "form[s] chemical complexes with a number of substances, including pharmacologically active ingredients" and that these complexes "can be taken advantage of to increase the absolute solubility of an active substance." Tr. 700:25-703:9 (Little Direct). Critically, the article notes that as the molecular weight of [redacted] increases, so does its ability to form complexes. Id. 704:1-13. Additionally, an article entitled "Solubility Enhancement with BASF Pharma Polymers" explained that [redacted] is "suitable for increasing the solubility of various APIs and other substances [due to] [its] ability to form water-soluble complexes." Id. 708:14-17. Finally, TWi's own internal formulation document confirms that [redacted] is a hydration promoting agent. PTX 146(A) (observing "[redacted]

[redacted]

For these reasons, the Court finds that the TWi Tablets contain a claim element 1(c) agent that enhances the solubility of oxcarbazepine selected from the group consisting of surface active agents, complexing agents, cyclodextrins, pH modifying agents, and hydration promoting agents, in the form of [redacted] Thus, the Court finds that Supernus has established by a preponderance of the evidence that the TWi Tablets infringe claim 1 of the ’898 and ’131 Patents.

Having found that [redacted] is an agent that enhances the solubility of oxcarbazepine, as required in claim element 1(c) of each of the Patents-in-Suit, the Court now turns to the percent by weight of the formulation limitation in claim element 1(c) of the ’930 Patent. Claim element 1(c) of the ’930 Patent requires that the formulation comprise “1-80%, by weight of the formulation, at least one agent that enhances the solubility of oxcarbazepine.” According to the stipulated composition of the TWi Tablets, as set forth in the Quality Overall Summary included in TWi’s ANDA, the 150 mg, 300 mg, and 600 mg TWi Tablets consist of [redacted] by weight of the formulation, respectively. PTX 364.2. Thus, the Court finds that each dosage unit of the TWi Tablets satisfies the percent by weight of the formulation limitation

set forth in claim element 1(c) of the ’930 Patent and, as a result, infringes Claim 1 of the ’930 Patent.

2. The Dependent Claims

Having determined that the TWi Tablets infringe claim 1 of each of the Patents-in-Suit, the Court now turns to the dependent claims. See Monsanto Co. v. Syngeta Seeds, Inc., 503 F.3d 1352, 1359 (Fed. Cir. 2007) (quoting Wahpeton Canvas Co., Inc. v. Frontier, Inc., 870 F.2d 1546, 1552 n.9 (Fed Cir. 1989) (“One may infringe an independent claim and not infringe a claim dependent on that claim.”).

Claim 11 of the ’898 Patent discloses “[t]he formulation of claim 10 in the form of tablets.” Claim 10, in turn, discloses “[t]he pharmaceutical formulation of claim 1 in the form of pellets, tablets, granules or capsules.” Similarly, claim 11 of the ’131 Patent discloses “[t]he method of claim 10, wherein the formulation is in the form of tablets.” Claim 10 of the ’131 Patent, from which claim 11 depends, discloses “[t]he method of claim 1, wherein the formulation is in the form of pellets, tablets, granules or capsules.” Claim 19 of the ’930 Patent discloses “[t]he formulation of claim 18, in the form of tablets.” Claim 18, in turn, covers “[t]he formulation of claim 1, in the form of pellets, granules or capsules.” TWi does not dispute that its ANDA Product is in the form of tablets. Def. Resp. PFOF ¶ 270 [Docket No. 297]. Thus, as the

Court has previously found that the TWi Tablets infringe claim 1 of the Patents-in-Suit, upon which each of these claims indirectly depends, the Court also finds that the TWi Tablets infringe claim 11 of the ’898 Patent, claim 11 of the ’131 Patent, and claim 19 of the ’930 Patent.

Finally, Supernus asserts claim 21 of the ’131 Patent, which discloses “[t]he method of claim 1, wherein the formulation is administered once a day.” As the Court has found that the TWi Tablets infringe claim 1 of the ’131 Patent and the TWi Tablets are admittedly for once-a-day administration, Def. Resp. PFOF ¶ 45, the Court finds that the TWi Tablets infringe claim 21 of the ’131 Patent.

C. Invalidity

Next, having founds that the TWi Tablets infringe each of asserted claims, the Court addresses TWi’s invalidity arguments. A patent and each of its claims are presumed to be valid, even where those claims may be dependent upon other invalid claims in the patent. 35 U.S.C. § 282(a). A party may rebut this presumption of validity with clear and convincing evidence of invalidity. Sciele Pharma Inc. v. Lupin Ltd., 684 F.3d 1253, 1260 (Fed. Cir. 2012) (citing 35 U.S.C. § 282; Microsoft Corp. v. i4i Ltd. P’ship, 131 S. Ct. 2238, 2245 (2011)). To be clear, the burden of establishing invalidity by clear and convincing evidence remains on the party asserting invalidity. In re

Cyclobenzeprine Hydrochloride Extended-Release Capsule Patent Litig., 676 F.3d 1063, 1078 (Fed. Cir. 2012). "The 'clear and convincing' standard of proof of facts is an intermediate standard which lies somewhere between 'beyond a reasonable doubt' and a 'preponderance of the evidence' . . . [and] has been described as evidence which produces in the mind of the trier of fact 'an abiding conviction that the truth of [the] factual contentions are highly probable.'" Bulldex Inc. v. Kason Indus., Inc., 849 F.2d 1461, 1463 (Fed. Cir. 1988) (quoting Colorado v. New Mexico, 467 U.S. 310, 316 (1984)).

As a defense to infringement, Defendants assert the following grounds for invalidity: lack of written description and indefiniteness. For the following reasons, the Court finds that TWi has not established by clear and convincing evidence that the Patents-in-Suit are invalid.[13]

[13] The Court comes to this conclusion exclusively on the basis of the record developed in this litigation. Nonetheless, the Court believes it merits noting that it has considered and rejected similar challenges to this term in the Patents-in-Suit in the Actavis Matter. Supernus, 2016 WL 527838, at *42-45. The Federal Circuit unanimously affirmed this Court's determination, including its determination that the Patents-in-Suit are not invalid as indefinite or for lack of written description. Supernus Pharm., Inc. v. Actavis Inc., 665 F. App'x 901 (Fed. Cir. 2016). The Court reiterates that, while its findings in the Actavis Matter do not have preclusive effect on TWi in this action, the findings remain relevant. See, e.g., Gillette Co. v. S.C. Johnson & Son, Inc., 919 F.2d 720, 723 (Fed. Cir. 1990) ("The fact that validity of those claims has previously been upheld in an earlier litigation is also to be given weight, though not stare decisis effect."); Stevenson v.

i. Written Description

TWi contends that the Patents-in-Suit are invalid for lack of a written description of a homogeneous matrix.

In pertinent part, 35 U.S.C. § 112 provides:

> The specification 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.

Stated differently, pursuant to 35 U.S.C. § 112, a patentee must provide a written description that allows a person of ordinary skill in the art to recognize that the patentee invented what is claimed. "The purpose of this provision is to ensure that the scope of the right to exclude, as set forth in the claims, does not overreach the scope of the [invention] as described in the patent specification." Reiffin v. Microsoft Corp., 214 F.3d 1342, 1345 (Fed. Cir. 2010); see also AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc., 759 F.3d 1285, 1298 (Fed. Cir. 2014) ("The essence of the written description requirement is that a patent applicant, as part of the bargain with the public, must describe his or her invention so that the public will know

Sears, Roebuck & Co., 713 F.2d 705, 711 (Fed. Cir. 1983) ("To be sure, a prior holding of 'validity' should be given weight in a subsequent suit on the issue of 'validity.' But the prior holding does not necessarily have stare decisis effect.").

what it is and that he or she has truly made the claimed invention.").

In order to satisfy the written description test, the application must "reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." Ariad Pharms., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010); Centocor Ortho Biotech, Inc. v. Abbott Labs, 636 F.3d 1341, 1348 (Fed. Cir. 2011). "The level of detail required . . . varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology." Ariad Pharms., 598 F.3d at 1351.

In support of its position that the "homogeneous matrix" limitation in the Patents-in-Suit lacks adequate written description, TWi advances several arguments. First, TWi argues that the term "homogeneous matrix" lacks written description because it was not claimed or disclosed by the inventors in the original patent application. Next, TWi argues that Paragraph [0034] of the original application, which the inventors reference in the prosecution history as support for the addition of the term "homogeneous matrix", does not actually disclose a matrix in which the constituents are uniformly dispersed. Thus, in TWi's view, Paragraph [0034] does not show that the inventors were actually in possession of a tablet comprising a matrix in

which the constituents are uniformly dispersed. Third, TWi contends that the Examples in the specifications do not necessarily result in a matrix in which the constituents are uniformly dispersed. Finally, TWi argues that Supernus cannot rely upon undisclosed protocols or tests to provide written description for the "homogeneous matrix" limitation.

The Court first addresses Defendants' arguments regarding the prosecution history. As a preliminary matter, the Court finds it irrelevant that the term "homogeneous matrix" did not appear in the original patent application. The prosecution history consistently indicates that the inventors were in possession of a matrix tablet in which the constituents were uniformly dispersed, as opposed to localized in a discrete portion or area of the tablet, such as a layer or coating. Indeed, it is clear from the prosecution history, and the parties do not genuinely dispute, that the term "homogeneous matrix" was added to the claim to address the Examiner's concerns that "matrix" alone may encompass the tablet's coating. The applicants disagreed with the Examiner's interpretation of the term "matrix", but nonetheless added the adjective "homogeneous" for purposes of clarity. PTX 5.206-07, 262-70, 281, 295, 298-99. Additionally, the prosecution history establishes that the inventors amended the claims to disclose a homogeneous matrix derived according to the manufacturing

process set forth in the Examples. Indeed, as support for the claim amendment, the applicants stated that "one of ordinary skill in the art would appreciate that the formulations derived according to the protocol set forth in the Examples would necessarily comprise a homogeneous matrix." PTX 5.298. In the Actavis Matter, this Court found that the term "homogeneous matrix" had adequate written description, reasoning that this language in the prosecution history constituted sufficient "'descriptive matter' that goes beyond simply describing the prior art[.]" Supernus, 2016 WL 527838, at *43. Based upon the record in this litigation, the Court sees no reason to deviate from this finding. Based on the prosecution history of the Patents-in-Suit, it is clear that the inventors were actually in possession of homogeneous matrix tablets, which were achieved using the protocol set forth in the Examples of the Supernus Patents.

The applicants also expressly relied upon Paragraph [0034] of the prosecution history for written support of the "homogeneous matrix" claim amendment. PTX 5.298. In pertinent part, Paragraph [0034] reads:

> The desired drug release pattern contemplated by this invention is achieved by using "matrix" polymers that hydrate and swell in aqueous media, such as biological fluids. As these polymers swell, they form a homogeneous matrix structure that maintains its shape during drug release and serves as a carrier for the drug, solubility enhancers and/or release promoters.

PTX 5.12. TWi argues that this passage does not describe a matrix in which the constituents are uniformly dispersed, but rather "what occurs to form a matrix after the tablet is administered, not in the dosage form itself." Tr. 811:4-10 (Elder Direct) (emphasis added). Thus, in TWi's view, this paragraph does not provide written description for "homogeneous matrix" as claimed in the Patents-in-Suit and as construed by this Court.

While Paragraph [0034] may explicitly discuss processes affecting the dosage unit after administration, the Court nonetheless finds that this passage in the prosecution history provides additional written description support for the term "homogeneous matrix." As Dr. Little cogently explained, the homogeneous matrix described in Paragraph [0034] is present prior to, during, and after administration and hydration. Tr. 929:3-9 (Little Direct); Tr. 937:24-938:4 (Little Cross). In rejecting TWi's argument, Dr. Little further explained that "it doesn't make sense to me that you would not have a uniform dispersion of the ingredients, and then when the water comes into the system, you now all of a sudden have a uniform dispersion of ingredients? That doesn't make sense, and that's not what somebody would read, a person of ordinary skill, when we read this paragraph [0034]." Tr. 929:3-9 (Little Direct). The Court is persuaded by Dr. Little's testimony that a person

of ordinary skill in the art reading Paragraph [0034] would understand that the inventors were in possession of a homogeneous matrix, as construed by this Court, prior to hydration or administration. Tr. 937:17-938:4 (Little Cross).

Next, TWi contends that the Examples in the specifications do not necessarily result in a homogeneous matrix and, thus, cannot provide adequate written description for the "homogeneous matrix" claim limitation. In support, TWi once again argues that due to the "paradox" of high shear wet granulation, the manufacturing process set forth in the specifications does not inevitably result in a homogeneous matrix in which the constituents are uniformly dispersed. For the reasons set forth above, the Court rejects this argument. See supra Section III.B.ii.1(a), pp. 28-31. Even if inhomogeneous granules result from high shear wet granulation, it does not follow that the matrix is inhomogeneous. As the asserted claims make clear, it is the matrix that must be homogeneous, not the individual granules. See Tr. 925:6-926:3 (Little Direct); '898 Patent, col. 12, ll. 51-54 (claiming a "homogeneous matrix") (emphasis added). Additionally, as Dr. Bugay persuasively testified, the granules created via this process are themselves uniformly dispersed across the matrix. Tr. 168:13-19, 174:2-7 (Bugay Direct).

In connection with this argument, TWi also claims that the Examples in the specifications do not disclose certain variables in the manufacturing process necessary to purportedly formulate a homogeneous matrix tablet. The Court rejects this argument outright. Examples 1 and 4 explicitly disclose the step-by-step manufacturing process used by the inventors to produce a homogeneous matrix tablet. See Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1563-66 (Fed. Cir. 1991) (drawing must convey with reasonable clarity that applicant was in possession of the later-claimed invention, including all the limitations and elements). This is confirmed by the inventors' statement that "the formulations derived according to the [manufacturing] protocol set forth in the Examples would necessarily comprise a homogeneous matrix." PTX 5.298. Likewise, it is clear from the testimony given at trial that the standard or default objective of a formulator using the high shear wet granulation process set forth in the specifications is to create a homogeneous matrix in which the ingredients are uniformly dispersed. Tr. 589:9-14, 590:2-12 (Little Direct); Tr. 170:21-172:16 (Bugay Direct).

Moreover, Dr. Little, Dr. Bhatt, and Dr. Bugay reviewed the process described in the specifications and concurred that the disclosures set forth a protocol that necessarily results in a homogeneous matrix. Tr. 924:18-25 (Little Direct); Tr. 94:24-96:5 (Bhatt Direct); Tr. 170:25-171:3 (Bugay Direct). Moreover,

this Court is persuaded by Dr. Little's opinion that the process disclosed in the Examples contains sufficient detail "to clearly communicate to a person of ordinary skill that you're talking about a process that would produce a homogeneous matrix tablet." Tr. 933:6-18 (Little Direct). Dr. Little carefully explained that the addition of more detailed instructions when describing merely an exemplary formulation is unnecessary. Id.

Finally, Examples 5 and 7 describe experiments in which the inventors actually administered the invention to canine and human subjects. Because 21 C.F.R. § 211.1(a) requires that experimental drugs pass FDA uniformity testing before administration to canine or human subjects, Supernus argues that these Examples establish that the inventors actually possessed homogeneous matrix tablets that passed uniformity testing. TWi challenges Supernus's reliance on the results of the underlying uniformity testing, as the testing is not specifically undisclosed in the Supernus Patents.

Both parties rely upon the Federal Circuit's decision in Allergan, Inc. v. Sandoz Inc., 796 F.3d 1293 (Fed. Cir. 2015). In Allergan, the Federal Circuit found that the claims in question did not lack adequate written description, but nonetheless found that the district court erred by relying on "undisclosed clinical protocol" that was "not part of the specifications of the asserted patents." Id. at 1309. The

court explained that such undisclosed clinical protocol "should not form the basis of the written description inquiry, even if it shows that the inventors had invented the claimed invention before the time of filing" because the "written description requirement requires possession as shown in the specification, not as shown by prior experimental work." Id. Supernus identifies other language in the Allergan opinion holding that a "claim that recites a property that is necessarily inherent in a formulation that is adequately described is not invalid as lacking written description merely because the property itself is not explicitly described." Id.

The Court need not resolve the question of whether the underlying uniformity tests are undisclosed protocols not properly considered by this Court or inherent properties of the tablets administered in Examples 5 and 7. As described above, even without the additional support in Examples 5 and 7, the "homogeneous matrix" claim limitation has ample written description in the specifications and prosecution history.

For the reasons set forth above, the Court finds that the specifications and prosecution history reasonably convey to persons skilled in the art that the inventors were in possession of tablets comprising a homogeneous matrix in which the constituents were uniformly dispersed as of the filing date. Accordingly, TWi has not carried its burden of establishing by

clear and convincing evidence that the Patents-in-Suit are invalid for lack of written description.

ii. Indefiniteness

Finally, TWi argues that the Patents-in-Suit are invalid as indefinite because the specification and prosecution history contain no guidance on how to determine whether a matrix is homogeneous. In its own words, TWi argues that "[i]f a POSA cannot discern when a homogeneous matrix becomes an inhomogeneous one--i.e. when is it no longer a matrix in which the constituents are uniformly dispersed--the 'homogeneous matrix' element is indefinite." s Def. Br. at 37.

Pursuant to 35 U.S.C. § 112(b), "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention." The Supreme Court has explained that this requirement "entails a 'delicate balance.'" Nautilus, Inc. v. Biosig Instruments, Inc., 134 S. Ct. 2120, 2128 (2014) (quoting Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 731 (2002)). Section 112(b) requires that a patent "be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them." Id. at 2129 (internal citations and quotations omitted). Nonetheless, it also recognizes "the

inherent limitations of language" and permits "[s]ome modicum of uncertainty." Id. at 2128.

In other words, Section 112(b) requires that "a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty." Id. at 2129. "The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable." Id.

TWi contends that the term "homogeneous matrix" is indefinite as it is an imprecise and subjective term of degree. In support of this position, TWi relies upon Dr. Elder's testimony that "homogeneous matrix" is not a term of art used in connection with dosage forms and that the Patents-in-Suit "do not disclose a test for homogeneity or uniformity and the tests asserted by Supernus are subjective at best." Tr. 838:4-11 (Elder Direct). TWi also points to several articles that refer to homogeneity existing in degrees. See Def. Br. at 39-40. Additionally, TWi urges the Court to find the Patents-in-Suit invalid as indefinite because nothing in the Supernus Patents or the prosecution history explains when a matrix is homogeneous or uniform or provides a test that a person of skill in the art can apply to make this determination. See id. at 41.

The Court disagrees. "Claims reciting terms of degree 'ha[ve] long been found definite' if they provide reasonable

certainty to a skilled artisan when read in the context of the patent. This requires a patent to provide 'some standard for measuring that [term of] degree." Mentor Graphics Corp. v. EVE-USA, Inc., 851 F.3d 1275, 1290 (Fed. Cir. 2017) (internal citations omitted) (quoting Biosig Instruments, Inc. v. Nautilus, Inc., 783 F.3d 1374, 1378 (Fed. Cir. 2015)). "[A] term of degree fails to provide sufficient notice of its scope if it depends 'on the unpredictable vagaries of any one person's opinion." Interval Licensing LLC v. AOL, Inc., 766 F.3d 1364, 1371 (Fed. Cir. 2014) (quoting Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1350 (Fed. Cir. 2005)).

Here, it is clear from the prosecution history that "one of ordinary skill in the art would appreciate that the formulations derived according to the protocol set forth in the Examples would necessarily comprise a homogeneous matrix." PTX 5.298; Tr. 929:20-930:22 (Little Direct). Dr. Little testified that the Examples in the Patents-in-Suit set forth a manufacturing process involving high-shear wet granulation. Id. 574:14-23, 932:7-933:18. Indeed, Example 4 discloses the manufacturing step-by-step process the inventors used to produce a homogeneous matrix tablet. Id.; '898 Patent, col. 10, l. 34–col. 11, l. 14. Additionally, the Court notes that the PTO never issued a rejection based on indefiniteness for the term "homogeneous matrix." See Tr. 923:7-10 (Little Direct); PTX 5. Moreover, as

Dr. Little and Dr. Bugay persuasively testified, a person of ordinary skill in the art could readily distinguish between a homogeneous matrix and a non-homogeneous matrix based upon the manufacturing process employed. Tr. 929:20-931:9 (Little Direct); Tr. 152:6-22 (Bugay Direct). A person skilled in the art could confirm that the manufacturing process in fact resulted in a homogeneous matrix, as intended, using FDA blend and content uniformity testing, FDA in vitro dissolution testing, and Raman chemical imaging. Tr. 660:22-662:6, 929:20-931:9 (Little Direct); Tr. 152:6-153:5, 163:8-168:19 (Bugay Direct); PTX 246.2-14.

The Court agrees that homogeneity comes in degrees. Indeed, Supernus does not genuinely contest this. This, however, is not fatal to the Patents-in-Suit. As the Court has explained above, the fact that is a term is one of degree does not preclude a finding of definiteness. Throughout the trial, it was clear to this Court that persons skilled in the art understand that perfect and absolute homogeneity is not achievable in this context because such molecular uniformity in a pharmaceutical dosage unit does not exist. Tr. 154:3-15 (Bugay Direct). Additionally, the record demonstrates that a person of ordinary skill in the art would understand that homogeneity and the uniform dispersion of constituents in this context is measured by lack of localization. Id. 165:10-168:10;

Tr. 661:9-662:6 (Little Direct). Indeed, Dr. Little testified that a person of ordinary skill in the art would understand, in view of the specifications and prosecution history of the Patents-in-Suit, that the term "homogeneous matrix" refers to a matrix in which the excipients set forth in claim elements 1(a)-(d) are uniformly dispersed, as opposed to localized in a particular area of the tablet. Tr. 566:19-569:5, 572:18-574:13, 929:20-930:22 (Little Direct). Thus, a person skilled in the art understands that a tablet comprises a homogeneous matrix so long as the matrix constituents are uniformly dispersed, rather than localized in a discrete portion of the tablet matrix, such as a coating or layer, regardless of the degree of uniformity achieved. See, e.g., Id. 929:10-930:22.

For the foregoing reasons, the Court finds that TWi has not carried its burden of establishing by clear and convincing evidence that the Patents-in-Suit are invalid as indefinite. As TWi has not rebutted the presumption of validity to which the Patents-in-Suit are entitled, the Court finds that the Patents-in-Suit are not invalid as indefinite.

IV. CONCLUSION

For the foregoing reasons, the Court finds that the Defendants' ANDA Product will infringe the '898 Patent, the '131 Patent, and the '930 Patent. The Court additionally finds that each of the Patents-in-Suit is valid. An appropriate Order shall issue herewith. The parties are hereby directed to submit a proposed form of judgment consistent with this Opinion.

s/Renée Marie Bumb
RENÉE MARIE BUMB
UNITED STATES DISTRICT JUDGE

Dated: August 15, 2017