Trials@uspto.gov
571.272.7822

Paper No. 10
Filed: April 10, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

HUBEI GRAND LIFE SCIENCE AND TECHNOLOGY CO., LTD,
Petitioner,

v.

VITAWORKS IP, LLC,
Patent Owner.

---

Case IPR2018-01768
Patent 9,573,890 B2

---

Before ERICA A. FRANKLIN, JENNIFER MEYER CHAGNON, and TIMOTHY G. MAJORS, *Administrative Patent Judges*.

FRANKLIN, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
*35 U.S.C. § 314*

# I. INTRODUCTION

Hubei Grand Life Science and Technology Co., Ltd. ("Petitioner"),[1] filed a Petition to institute *inter partes* review of claims 1 and 3–10 of U.S. Patent No. 9,573,890 B2 (Ex. 1001, "the '890 patent"). Paper 2 ("Pet."). Vitaworks IP, LLC ("Patent Owner") filed a Preliminary Response to the Petition. Paper 6 ("Prelim. Resp.").

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). Upon considering the Petition, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing the unpatentability of at least one challenged claim. Accordingly, we institute an *inter partes* review of all challenged claims based upon all grounds raised in the Petition.

## *A. Related Proceedings*

Petitioner states that it is a named defendant in *Vitaworks IP, LLC v. Hubei Grand Life Science and Technology Co., Ltd. et al.*, No. 2:17-cv-12358-CCC-MF (D.N.J. filed Dec. 1, 2017), a litigation in which the '890 patent is asserted. Pet. 4. According to Petitioner, however, Vitaworks IP, LLC, has not served a complaint in that proceeding on Petitioner. *Id.* Petitioner also identifies two other pending litigations related to the '890 patent. *Id.* at 4–5. Patent Owner identifies the same three proceedings. Paper 3, 1.

[1] Petitioner identifies a number of entities as the real parties-in-interest in this proceeding. Pet. 3–4. We do not repeat that listing here.

As for related matters before the Board, Petitioner identifies two pending petitions for *inter partes* review, which were filed concurrently with the present Petition. Pet. 5. Those petitions challenge U.S. Patent No. 9,428,450 B2 ("the '450 patent") (IPR2018-01766) and U.S. Patent No. 9,428,451 B2 ("the '451 patent") (IPR2018-01767).[2] *Id.*

### *B. The '890 Patent*

The '890 patent is directed to a process for producing taurine from alkali isethionate "in a high overall yield" by carrying out the ammonolysis reaction in the presence of alkali ditaurinate and/or alkali tritaurinate. Ex. 1001, 1:14–18. Taurine, 2-aminoethanesulfonic acid, "is one of the amino sulfonic acids found in the tissues of many animals," and exhibits "beneficial pharmacological effects, such as detoxification, fatigue-relief, and nourishinging and tonifying effects." *Id.* at 1:26–27. Thus, "taurine finds wide applications as an essential ingredient for human and animal nutrition." *Id.* at 1:27–29.

The '890 patent describes an existing method of producing taurine known as the "ethylene oxide process," *id.* at 1:32–38, which we may refer to as the "EO process." In this process, ethylene oxide is first reacted with sodium bisulfite to produce sodium isethionate, which is then subjected to an ammonolysis reaction to yield sodium taurinate. *Id.* at 1:32–38. The ammonolysis reaction may be catalyzed with, e.g., sodium sulfate, sodium sulfite, or sodium carbonate. *Id.* at 1:56–58. The resulting sodium taurinate

[2] The '451 patent issued on a continuation-in-part (CIP) application to the application that issued as the '450 patent; the '890 patent issued on a CIP application of the application that issued as the '451 patent.

is then neutralized with an acid (e.g., hydrochloric acid, and preferably sulfuric acid), to produce taurine. *Id.* at 1:36–38.

According to the '890 patent, this EO process is "well established and widely practiced in commercial production." *Id.* at 1:39–40. Nevertheless, the '890 patent explains, "overall yield is not very high," and "the process generates a large amount of waste stream that is increasingly difficult to dispose of." *Id.* at 1:40–43. The Specification explains that byproducts of the EO process include, among other compounds, alkali ditaurinate and alkali tritaurinate. Specifically, the '890 patent concludes, from the teachings of the cited prior art references, that "the ammonolysis of sodium isethionate invariably yields a mixture of sodium taurinate, sodium ditaurinate, and sodium tritaurinate." *Id.* at 2:9–12.

By neutralizing with an acid, as noted above, the sodium taurinate can be converted to taurine and filtered out. Ex. 1001, 2:21–26 (describing a known technique wherein "[c]rude taurine is easily obtained [following neutralization of sodium taurinate in acid] by filtration from a crystalline suspension of taurine after cooling"). The remaining waste supernatant, also known as the "mother liquor," still includes taurine, sodium sulfate, along with byproducts of the reaction, i.e., sodium ditaurinate, sodium tritaurinate, and sodium isethionate. *Id.* at 2:26–29, 58–66.

### *C. Illustrative Claim*

Petitioner challenges claims 1 and 3–10. Claim 1, the only independent claim, is illustrative and reads as follows:

> 1. A process for the producing taurine from alkali isethionate, comprising:
>
> (a) mixing alkali isethionate with a solution of alkali ditaurinate, alkali tritaurinate, or their mixture in the presence of one or more catalysts;

(b) adding an excess of ammonia to the (a) and subjecting the solution to ammonolysis reaction to yield a mixture of alkali taurinate, alkali ditaurinate, and alkali tritaurinate;
(c) removing excess ammonia and neutralizing with an acid to obtain a crystalline suspension of taurine; and
(d) separating taurine by means of solid-liquid separation.

Ex. 1001, 6:50–61.

*D. The Asserted Grounds of Unpatentability*

Petitioner challenges the patentability of claims 1 and 3–10 of the '890 patent on the following grounds:

| Claims | Basis | References |
|---|---|---|
| 1 and 3–10 | § 103(a) | Liu[3] and DD 023[4] |
| 1 and 3–10 | § 103(a) | Wu,[5] DD 023, and Liu |
| 1 and 3–10 | § 103(a) | Chen,[6] DD 023, and Wu |

Petitioner also relies on the Declaration of Mark A. Lipton, Ph.D. (Ex. 1003), among other evidence. Patent Owner relies upon the Declaration of Robert E. Maleczka, Jr., Ph.D. (Ex. 2001).

[3] Liu Fuming, *Process Design of Taurine Ammonolysis*, 5:8 CHINA CHEMICAL TRADE 120 (2013) (Ex. 1018), English Translation (Ex. 1019) ("Liu").
[4] Bach et al., DD 219 023 A3, published Feb. 20, 1985 (Exhibit 1010), English Translation (Ex. 1011) ("DD 023").
[5] Wu Jiang et al., *Optimization on Ammonolysis in Manufacturing Method of Taurine*, 19:1 JOURNAL OF HUBEI POLYTECHNIC UNIVERSITY 23–26 (2004) (Ex. 1015), English Translation (Ex. 1016) ("Wu").
[6] Yong Chen, US 2014/0121405 by, published May 1, 2014 (Ex. 1022) ("Chen").

## II. ANALYSIS

### *A. Claim Construction*

In an *inter partes* review, we interpret claim terms in an unexpired patent based on the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2018); *Cuozzo Speed Techs., LLC v. Lee*, 136 S.Ct. 2131, 2142 (2016) (affirming applicability of the broadest reasonable construction standard in *inter partes* review proceedings).[7] Under that standard, and absent any special definitions, we give claim terms their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007); *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) ("Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history.").

Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

In the Petition and the Patent Owner's Preliminary Response, neither party contends that any claim terms require express construction. Pet. 12; Prelim. Resp. 9. We agree. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*,

---

[7] The Final Rule changing the claim construction standard in IPR proceedings does not apply here, as the Petition was filed before the rule's effective date, November 13, 2018. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,340, 51,344 (Oct. 11, 2018). Nevertheless, we do not perceive on this record that the construction would be different if the standard in the above-noted Final Rule were applied.

200 F.3d 795, 803 (Fed. Cir. 1999) (only terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

After Patent Owner's Preliminary Response was filed, however, an issue arose related to whether the claims require a "second" or "subsequent" ammonolysis step.[8] *See* Paper 8, 5–6; Paper 9, 1–3. We address that issue here.

According to Petitioner, the question whether the claims require a "second" ammonolysis step is "not an issue of claim construction," but instead goes to Patent Owner's attempt to distinguish the cited prior art. Paper 8, 5–6. Petitioner disagrees with Patent Owner that each claim "implicitly" includes a second ammonolysis step by requiring a solution of di- and/or tritaurinate in step (a). *Id.* at 5. Petitioner contends that Patent Owner is urging that the claims require a "second" ammonolysis step because Patent Owner argues that the prior art discloses a first ammonolysis reaction, but does not describe "precise conditions" for a second ammonolysis reaction. *Id.* at 6. However, Petitioner contends "the claims themselves" confirm that a second ammonolysis step is not required. *Id.* at 5

[8] The Board held a conference call with counsel for the parties, and the Board authorized further pre-institution briefing on two issues: (i) whether statements of Patent Owner in other proceedings were inconsistent with positions taken in the Preliminary Response; and (ii) whether the claims require a second ammonolysis step. Paper 8 (Petitioner's Reply); Paper 9 (Patent Owner's Sur-Reply).

(citing, e.g., dependent claim 2 (reciting "wherein alkali taurinate and alkali tritaurinate are produced from diethanolamine and triethanolamine")).

Patent Owner responds that "[t]he claims at issue in all three [related] patents ['450 patent, '451 patent, and '890 patent] require a 'second' or subsequent ammonolysis reaction." Paper 9, 1. According to Patent Owner, a "first" ammonolysis is one conducted first in time and without any "alkali di- and/or tritaurinate, (collectively 'ditaurinate')." *Id.* Patent Owner contends that "[i]n all the challenged claims ditaurinate is present in the reaction mixture before ammonolysis [and] therefore they all read on a second ammonolysis." *Id.*

We determine, for purposes of this Decision, that the process recited in independent claim 1 of the '890 patent does not require a second ammonolysis step. Unlike in the claims of the '451 patent, the claims of the '890 patent do not recite a step requiring "*returning* the mother liquor . . . for *further ammonolysis* of alkali ditaurinate, alkali tritaurinate," that may be considered a *second* ammonolysis step. *See* IPR2018-01767, Ex. 1001, 8:17–21, 34–36 (emphases added). Instead, here, the process of claim 1 begins with a mixing step, wherein alkali ditaurinate and/or alkali tritaurinate are already in solution. That claim does not describe or otherwise limit how, i.e., by what process, that solution is provided. In particular, claim 1 does not specify that the alkali ditaurinate and/or alkali tritaurinate must come from an earlier ammonolysis reaction, as Patent Owner asserts.

The only ammonolysis reaction recited or required by claim 1 occurs in the next step of the process, wherein the solution of alkali ditaurinate and/or alkali tritaurinate that was mixed with alkali isethionate in the presence of one or more catalysts in step (a) is combined with an excess of

ammonia and subjected to ammonolysis in step (b). Unlike in the'451 patent, the last step recited in claim 1 of the '890 patent, i.e., step (d), merely requires "separating taurine by means of solid-liquid separation," without any further processing or ammonolysis. Thus, at this stage, we do not find any step of claim 1 implicitly or expressly requires a second ammonolysis step.

We recognize, however, that claim 1 may "read on" the use of a mixture of alkali ditaurinate and alkali tritaurinate that was produced as byproducts of an ammonolysis reaction of alkali isethionate. Indeed, such a process is recited in dependent claim 3. Ex. 1001, 6:65–67. In that context, step (b) might be characterized as a "second" ammonolysis, as argued by Patent Owner. Paper 9, 1–2.

But what a claim may "read on" (i.e., encompass) is not the same as what the claim *requires*. And, as Petitioner demonstrates persuasively, claim 1 is broader and does not necessarily require alkali ditaurinate and alkali tritaurinate in step (a) be produced from an ammonolysis reaction. Dependent claim 2, not challenged in any ground in the Petition, recites that "alkali ditaurinate and alkali tritaurinate are prepared from diethanolamine and triethanolamine," respectively. Paper 8, 5; Ex. 1001, 6:62–64. Dependent claim 2, thus, provides additional evidence that the alkali ditaurinate and alkali tritaurinate in claim 1 need not be the product of an ammonolysis step. Hence, the ammonolysis reaction recited in claim 1's step (b) need not be a "second" ammonolysis step.

Therefore, we conclude for purposes of this Decision, that the challenged claims of the '890 patent do not require both "first" and "second" ammonolysis reactions, except for dependent claim 3, wherein a prior

ammonolysis step is required to produce the alkali ditaurinate and alkali tritaurinate used in step (a).

*B. Level of Ordinary Skill in the Art*

The level of skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Petitioner describes a person having ordinary skill in the art as follows:

> [A] POSA at the time of the alleged invention . . . would have an advanced degree, such as a Master's or Ph.D., in the field of organic chemistry or a closely related field. (Ex. 1003, ¶ 17). A POSA would also have at least five years of experience with organic synthesis of nitrogen-containing compounds, and would understand basic chemistry principles and organic synthesis techniques. (*Id.*)

Pet. 12. Patent Owner agrees. Prelim. Resp. 10; Ex. 2001 ¶¶ 21–22.

At this stage in the proceeding, we find that the parties' agreed-upon description of the level of ordinary skill in the art is sufficiently supported by the current record. Moreover, we note that the applied prior art reflects the appropriate level of skill at the time of the claimed invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Thus, for purposes of this Decision, we adopt the parties' agreed-upon description of a person of ordinary skill in the art.

*C. Obviousness over Liu and DD 023*

Petitioner asserts that claims 1 and 3–10 would have been obvious over Liu and DD 023. Pet. 21–39. Patent Owner disagrees. Prelim. Resp. 26–33.

*1. Liu*

Liu relates to ammonolysis and a method for the large-scale production of taurine, a product Liu describes as having "been applied extensively in the pharmaceutical and food industries." Ex. 1019, 6. Liu further "explains the process of producing taurine using the ethylene oxide method [i.e., the EO process], the theoretical analysis of ammonolysis, [and] the applications of the mother liquor in production." *Id.*

Liu describes a reaction between ethylene oxide and sodium bisulfite solution under alkaline conditions (30% sodium hydroxide) that produces 2-sodium isethionate. Ex. 1019, 6. That product then undergoes an initial ammonolysis reaction at high temperature and pressure (18–19.5 MPa, 265–270°C) to generate 2-sodium aminoethanesulfonate (i.e., sodium taurinate). *Id.* Liu further teaches that a neutralization of sodium taurinate in sulfuric acid generates sodium sulfate and taurine. *Id.* After the neutralization reaction, the crude taurine and sodium sulfate are removed and the mother liquor remains. *Id.* According to Liu, "[c]omponent analysis of the mother liquor indicates that it contains many components," including, *inter alia*, remaining taurine, 2-sodium isethionate, sodium sulfate, and sodium ditaurinate. *Id.* Liu explains that this mother liquor, if released, "becomes highly concentrated contaminated emissions, damaging and polluting the environment." *Id.*

To address that concerns, Liu describes an "Application of Mother Liquor Recycle in Production." Ex. 1019, 6 (emphasis omitted). Liu teaches that "[t]he 2-sodium isethionate that does not participate in ammonolysis follows the production system into the next process." *Id.* According to Liu, "[e]xcluding a small amount that undergoes a secondary reaction, the majority exists in the mother liquor in the form of 2-sodium

isethionate," and "[t]he mother liquor can undergo the corresponding processing and purification to participate again in ammonolysis in the form of sodium isethionate." *Id.* Moreover, Liu discloses, "sodium ditaurinate is also generated during the ammonolysis process." *Id.* According to Liu, "[t]his sodium ditaurinate also exists in the mother liquor system," and "[i]f this sodium ditaurinate is fed again into ammonolysis, the proportion of 2-sodium isethionate in the reaction product can be increased, increasing generation yield." *Id.*

Liu further teaches that "[a]mmonolysis process reaction yield can be increased from 70%-80% to 85%-95%." Ex. 1019, 6. And, Liu discloses, the "equipment operations are stable, reducing the discharge of waste liquids and overall production costs." *Id.*

*2. DD 023*

DD 023 discloses a method for producing "sodium taurine by converting sodium isethionate with ammonia in the presence of neutral and strong alkaline electrolytes." Ex. 1011, 1. DD 023 explains that the reaction involves "the formation of undesired byproducts, i.e. ditaurine and tritaurine," and describes a method for limiting their contents. *Id.*

*3. Analysis*

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). "An obviousness determination requires finding both 'that a skilled artisan would have been motivated to combine the teachings of the prior art

references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.'" *CRFD Research, Inc. v. Matal*, 876 F.3d 1330, 1340 (Fed. Cir. 2017) (quoting *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–1368 (Fed. Cir. 2016)). "The reasonable expectation of success requirement refers to the likelihood of success in combining references to meet the limitations of the claimed invention." *Intelligent Bio-Sys., Inc.*, 821 F.3d at 1367.

Petitioner asserts "the production of taurine through the ammonolysis of alkali isethionate has been known for more than eighty years." Pet. 23 (citations omitted). According to Petitioner, a person of ordinary skill in the art would have understood that Liu and DD 023 disclose such production and, together, they teach every limitation of claim 1. Pet. 21–23 (citing Ex. 1003 ¶¶ 65–66, 73–76). Specifically, Petitioner asserts that Liu teaches step (a) of claim 1 by disclosing a process of producing taurine, wherein "sodium taurinate, sodium isethionate, and sodium ditaurinate are among the species in the reaction mixture, or mother liquor, after ammonolysis," and wherein the mother liquor containing sodium isethionate and sodium ditaurinate can participate in the ammonolysis again. *Id.* at 25 (citing Ex. 1019, 6; Ex. 1003 ¶¶ 67, 74). Petitioner asserts that mixture of sodium isethionate and sodium ditaurinate meets the claim requirement in step (a) without any alkali tritaurinate because the claim uses the term "or" when referring to those components, i.e., "a solution of alkali ditaurinate, alkali tritaurinate, or their mixture." *Id.* at 27.

Further, Petitioner asserts that because Liu describes the "Addition Reaction" taking place in 30% sodium hydroxide, a person of ordinary skill in the art would have understood that the sodium hydroxide is part of the

reaction environment and will remain in the reaction system during the ammonolysis reaction that followed the "Addition Reaction." *Id.* at 26 (citing Ex. 1003 ¶¶ 68–69, 73). According to Petitioner, that sodium hydroxide would function as a catalyst during the ammonolysis of sodium isethionate. *Id.*

Petitioner asserts also that DD 023 discloses that taurine salt, sodium taurinate ($H_2NCH_2CH_2SO_3Na$), is prepared through a reaction of sodium isethionate ($HOCH_2CH_2SO_3HNa$) with ammonia ($NH_3$). *Id.* at 23 (citing Ex. 1011, Abstract; Ex. 1003 ¶ 73).

Regarding step (b), Petitioner relies upon Liu's disclosure that excess ammonia is recovered through the "ammonia absorption system," after the ammonolysis reaction. Pet. 29 (citing Ex. 1019, 6). Petitioner asserts that a person of ordinary skill in the art would have understood from that disclosure that excess ammonia was used during the ammonolysis reaction. *Id.* (citing Ex. 1003 ¶¶ 43–44.) Further, Petitioner asserts that it "would have been obvious for a POSA to use excess ammonia during the ammonolysis reaction," because the skilled artisan would have known that the desired product, sodium taurinate is a primary amine and that excess ammonia in an ammonolysis reaction "favors the formation of primary amines over secondary and tertiary amines." *Id.* (citing Ex. 1003 ¶¶ 42–44).

As for the yield of a mixture of alkali taurinate, alkali ditaurinate, and alkali tritaurinate required by step (b), Petitioner asserts that because the claim discloses an identical ammonolysis of sodium isethionate reaction as in Liu, the resulting species are "inevitable and are necessarily disclosed in Liu." *Id.* Further, Petitioner asserts that DD 023 confirms that the recited species would be formed in the ammonolysis reaction. *Id.* at 30 (citing Ex. 1011, Abstract; Ex. 1003 ¶ 73).

Regarding step (c), Petitioner asserts here again that Liu discloses that excess ammonia is recovered through the "ammonia absorption system," after the ammonolysis reaction, as a person of ordinary skill in the art would have known to do. *Id.* at 30–31(citing Ex. 1019, 6; Ex. 1003 ¶¶ 43–44, 65). Petitioner asserts also that Liu discloses that "after the ammonolysis reaction, a neutralization occurs to generate taurine, and a POSA would have understood that crystalline taurine inevitably forms in this neutralization reaction." *Id.* at 31 (citing Ex. 1003 ¶¶ 66–67).

Regarding step (d), Petitioner asserts that Liu discloses that taurine and sodium sulfate are removed from the reaction mixture after the neutralization reaction. *Id.* (citing Ex. 1019, 6). According to Petitioner, and a person of skill in the art would have understood that neutralized taurine may be easily separated through solid-liquid separation, a technique well known in the prior art. *Id.* (citing Ex. 1003 ¶¶ 67, 71).

According to Petitioner, a person of ordinary skill in the art would have been motivated to combine Liu and DD 023 because each reference is directed to a process for synthesizing, and improving the overall yield of, taurine through ammonolysis of sodium isethionate. Pet. 32.

Petitioner asserts that a person of skill in the art would have had a reasonable expectation of success in combining the teachings of Liu and DD 023 to produce taurine from alkali isethionate because Liu sets forth a well-known process for such production and discloses that the remaining byproducts in the mother liquor from the ammonolysis reaction, which DD 023 confirms to include sodium taurinate, sodium ditaurinate, and sodium tritaurinate, may be fed back into the ammonolysis of isethionate reaction system again. *Id.* at 32–33.

Petitioner asserts that additional motivation is supplied by Liu's disclosure that, in its process, the "ammonolysis is a reversible, i.e., an equilibrium reaction." *Id.* at 33 (citing Ex. 1003 ¶ 78). According to Petitioner and Dr. Lipton, "a POSA desiring to increase the yield of taurine and make the taurine synthesis process more efficient would have been motived to apply fundamental chemistry principles, such as Le Châtelier's Principle,[9] and conduct the ammonolysis reaction in the presence of sodium taurinate and sodium tritaurinate," two of the three amines that DD 023 discloses are formed in this equilibrium reaction. *Id.*; Ex. 1003 ¶ 78. Based on that principle, Petitioner and Dr. Lipton assert that the equilibrium may be shifted by adding those two out of those three byproducts, along with the sodium isethionate reagent into the ammonolysis reaction "in order to drive the reaction of the third, and desired, product (sodium taurinate)." *Id.* (citing Ex. 1003 ¶¶ 78–79). According to Petitioner, "in doing so, the POSA would have had a reasonable expectation that taurine would be produced at a very high yield because the equilibrium system would consume the excess sodium ditaurinate and sodium tritaurinate, as well as sodium taurinate, to produce more sodium taurinate." *Id.* at 33–34 (citing Ex. 1003 ¶ 80).

Based upon our review and consideration of the current record, we determine that Petitioner has established a reasonable likelihood of successfully demonstrating that claim 1 is unpatentable over the combination

[9] Dr. Lipton states, "Le Châtelier's Principle dictates that 'whenever the concentration of a component changes, the equilibrium system reacts to consume some of the added substance or produce some of removed substance.'" Ex. 1003 ¶ 78 (quoting M. Silberberg, *Equilibrium: The Extent of Chemical Reactions*, 4th Ed. CHEMISTRY: THE MOLECULAR NATURE OF MATTER AND CHANGE, 722–753 (2006) (Ex. 1023, 46)) (emphasis omitted).

of Liu and DD 023. In particular, the information presented at this stage of the proceeding supports Petitioner's assertions that a person of ordinary skill in the art would have been motivated to combine the teachings of Liu and DD 023 to provide an efficient process of synthesizing taurine from alkali isethionate, in the manner claimed, with a reasonable expectation of successfully doing so.

In reaching those determinations, we considered Patent Owner's arguments and found them deficient, based on the current record, as explained in the following discussion.

Patent Owner challenges the sufficiency of Liu's disclosure regarding conducting an ammonolysis reaction using, i.e., recycling, the mother liquor of prior ammonolysis reaction. Prelim. Resp. 26. Patent Owner begins by asserting that such use of the mother liquor in Liu is not enabled as Liu does not describe the procedure or reaction conditions used for a second ammonolysis step. *Id.* at 26–27 (citing Ex. 2001 ¶¶ 61, 62, 88–95). However, the disclosures in prior art publications, e.g., Liu, are presumed to be enabled for the ordinarily skilled person absent persuasive evidence to the contrary, which Patent Owner does not provide on this record. *See Impax Labs., Inc. v. Aventis Pharms., Inc.*, 545 F.3d 1312, 1316 (Fed. Cir. 2008) (patentee may overcome the presumption of enablement by establishing with persuasive evidence that the prior art does not enable the claimed invention).

According to Patent Owner, the reaction chemistry of a second ammonolysis step is fundamentally different from the first because there are no di- and tritaurinates present during a first ammonolysis. Prelim. Resp. 27. Patent Owner asserts that Liu "offers no reason to assume that what it did for its first ammonolysis would be appropriate for a second ammonolysis given the added components." *Id.* Patent Owner, however, premises that

argument upon an unestablished assertion, that there is a fundamental difference in the process of the second ammonolysis. Liu makes no such suggestion. Neither do the challenged claims. Indeed, the claims recite a simple step of adding an excess of ammonia to the mixture of alkali isethionate, alkali ditaurinate, and alkali tritaurinate prepared in step (a) and then subjecting the solution to an ammonolysis reaction, i.e., the same process that Petitioner has demonstrated that Liu teaches for its "first" ammonolysis reaction. Thus, based on the current record, the evidence does not support finding that an ammonolysis reaction must be carried out differently on a solution comprising alkali ditaurinate and alkali tritaurinate than on a solution without those species. In other words, we are not persuaded that a person of ordinary skill in the art would not understand that Liu's process of producing taurine from isethionate may be conducted in the manner disclosed for initial and subsequent reactions, including wherein the mother liquor "participates again in ammonolysis." Ex. 1019, 6.

Patent Owner asserts that Liu's chemistry differs from what is claimed because "the claims require a reaction mixture that includes isethionate and di- and/or tritaurinate prior to ammonolysis in a second ammonolysis step," but the experts "appear to actually agree that isethionate is consumed in the ammonolysis reaction to produce taurinate as well as ditaurinate and tritaurinate." Prelim. Resp. 28–29 (citing Ex. 2001 ¶¶ 30, 48, 52; Ex. 1003 ¶ 48). As discussed above in Section II. A., we do not find that the claims require a second ammonolysis step, with the exception of dependent claim 3. Further, we do not find that the testimony cited by Patent Owner supports its assertion that there is agreement among Drs. Maleczka and Lipton that isethionate is "consumed" in the ammonolysis reaction. At most, we find, in an uncited paragraph of Dr. Maleczka's testimony, that he opines that Liu's

process reduces the amount of isethionate in the reaction product. *See* Ex. 2001 ¶ 89. Insofar as that opinion contradicts Liu's disclosure that an increase in isethionate content in the reaction product is realized, Ex. 1019, 6, we leave the issue for trial.

Patent Owner asserts that Liu also differs from the claimed invention because Liu does not disclose using and recovering excess ammonia after its second ammonolysis step. Prelim. Resp. 29. However, based on the current record, Petitioner has demonstrated persuasively that a person of ordinary skill in the art would have understood that adding excess ammonia is a standard protocol for an ammonolysis reaction, and that doing so would favor Liu's formation of taurinate/taurine. Pet. 23–24 (citing Ex. 1003 ¶ 42). Further, as discussed above, Petitioner argues persuasively that a person of ordinary skill in the art would have understood that excess ammonia was used and then recovered based upon Liu's disclosure that "[a]fter flash evaporation, the vapor enters the ammonia absorption system and the liquid enters the evaporation system." Ex. 1019, 6. Moreover, we find persuasive Petitioner's assertion that a person of ordinary skill in the art would have known to remove excess ammonia after an ammonolysis reaction, as such process step was well known and within the skill in the art. *See* Pet. 30–31(citing Ex. 1019, 6; Ex. 1003 ¶¶ 43–44, 65).

Additionally, Patent Owner asserts that Liu differs from the claimed invention because Liu does not disclose neutralizing the solution after its second ammonolysis step. Prelim. Resp. 29. However, as we have discussed, the current record does not provide a reason to believe that a person of ordinary skill in the art would not have understood that Liu's subsequent or second ammonolysis reaction would not proceed in the same manner as Liu discloses for its first process. Petitioner has demonstrated

that Liu discloses in that process a neutralization reaction that occurs after the ammonolysis reaction to generate taurine. Pet. 31; Ex. 1019, 6. Thus, based on the current record, we find that disclosure is sufficient to demonstrate that a neutralization reaction would similarly occur during Liu's suggested further, i.e., second, ammonolysis reaction.

Patent Owner asserts also that Liu does not mention the use of a catalyst when it suggests recycling the mother liquor for further ammonolysis. Prelim. Resp. 29. According to Patent Owner, the sodium hydroxide catalyst that Petitioner argues is part of the reaction environment that remains during a second ammonolysis is only taught as the condition used during the "Addition Reaction" to create sodium isethionate, and the solution from that reaction is unlikely to remain basic after the neutralization reaction. *Id.* at 29–30 (citing Ex. 1019, 6; Ex. 2001 ¶ 94). It is unclear from Patent Owner's argument, or cited declaration testimony, why the same reaction environment created prior to Liu's first ammonolysis reaction, i.e., the "Addition Reaction," would not again be done in preparation for a second ammonolysis, such that the sodium hydroxide present would again function as a catalyst in the reaction system. Nor does that argument or declaration testimony address Petitioner's assertion that the '890 patent admits that it was known in the art to add a catalyst, such as sodium hydroxide, in the ammonolysis of isethionate. *See* Pet. 26 (citing Ex. 1001, 1:58–2:8).

Thus, based on the information presented at this stage of the proceeding, we determine that Petitioner has shown sufficiently that there is a reasonable likelihood that it would prevail in showing the unpatentability of independent claim 1 as obvious over the combination of Liu and DD 023.

We have also reviewed the evidence and arguments relating to the dependent claims and determine, at this stage in the proceeding, that Petitioner has demonstrated a reasonable likelihood that those claims are also rendered obvious by the combined references. For example, claim 6 requires selecting the catalyst(s) form the ammonolysis reaction from a group including alkali salts of hydroxide. Ex. 1001, 7:4–7. Patent Owner asserts that Liu does not teach adding a catalyst to a second ammonolysis. Prelim. Resp. 34–35. However, as discussed above, based on the current record, Petitioner has argued persuasively that a person of ordinary skill in the art would have understood Liu's teaching to recycle the mother liquor means to feed it back into its disclosed ammonolysis step, wherein sodium hydroxide catalyst is present in the reaction environment as a result of the "Addition Reaction." *See* Ex. 1018, 6.

Dependent claims 7, 9, and 10 each recite the production yield of taurine is greater than 95%, 85%, and 90%, respectively. Ex. 1001, 7:12–14, 17–20. Liu teaches that the ammonolysis process reaction yield can be increased to "85–95%." Ex. 1018, 6. Patent Owner challenges that disclosure by asserting that Liu lacks specificity regarding "what its stated yields mean" and fails to provide "experimental support." Prelim. Resp. 32. At this stage in the proceeding, those assertions are insufficient to overcome Petitioner's evidence, i.e., Liu's express disclosure, demonstrating a reasonable likelihood of successfully showing that those claims are unpatentable.

*D. Obviousness over Combinations Including Wu and/or Chen*

In the remaining grounds, Petitioner asserts that claims 1 and 3–10 would also have been obvious over the combination of Wu, DD 023, and Liu, and over the combination of Chen, DD 023, and Wu. Pet. 39–67. Patent Owner disagrees. Prelim. Resp. 33–46.

For the remaining grounds, Petitioner relies upon Wu or Chen, in place of Liu, as teaching or suggesting each element of independent claim 1, in combination with DD 023. *See* Pet. 40–47, 53–60. We do not provide an analysis of those grounds, as we have already determined that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing the unpatentability of each of the challenged claims based upon a combination of similar teachings and over similar arguments raised by Patent Owner. In view of that determination, we institute an *inter partes* review of all the challenged claims based upon all grounds raised in the Petition.

## III. CONCLUSION

For the foregoing reasons, we conclude that the information presented in the Petition establishes a reasonable likelihood that Petitioner would prevail in showing that at least one of the challenged claims of the '890 patent is unpatentable.

At this stage of the proceeding, the Board has not made a final determination as to the construction of any claim term or the patentability of any challenged claim.

## IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314, an *inter partes* review of claims 1 and 3–10 of the '890 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314 and 37 C.F.R. § 42.4(b), *inter partes* review of the '890 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

PETITIONER:

Thomas J. Parker
Stephen Yang
ALSTON & BIRD LLP
thomas.parker@alston.com
stephen.yang@alston.com
HGL-IPR@alston.com

PATENT OWNER:

Michael H. Teschner
Aaron S. Eckenthal
Lingyan Wang
LERNER, DAVID, LITTENBERG,
KRUMHOLZ & MENTLIK, LLP
mteschner.ipr@ldlkm.com
aeckenthal.ipr@lernerdavid.com
lwang@lernerdavid.com