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Paper 40
Entered: June 26, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ORGANIK KIMYA AS,
Petitioner,

v.

ROHM AND HAAS COMPANY,
Patent Owner.

Case IPR2014-00350
Patent 6,252,004 B1

Before TONI R. SCHEINER, LORA M. GREEN, and ERICA A. FRANKLIN, *Administrative Patent Judges.*

FRANKLIN, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Organik Kimya AS ("Petitioner") filed a Petition (Paper 2, "Pet.") to institute an *inter partes* review of claims 1–7 of U.S. Patent No. 6,252,004 B1 (Ex. 1001, "the '004 patent"). Patent Owner, Rohm and Haas Company, did not file a Preliminary Response to the Petition.

In an Institution Decision (Paper 9, "Inst. Dec."), an *inter partes* review of claims 1–7 was instituted. After the Institution Decision, Patent Owner filed a Response (Paper 22, "PO Resp.") and a contingent Motion to Amend Claims (Paper 23, "Mot. Amend"). In response, Petitioner filed a Reply (Paper 27, "Pet. Reply") and an Opposition to the Motion to Amend (Paper 28). Patent Owner then filed a Reply to Petitioner's Opposition (Paper 31). The parties presented arguments at an oral hearing (Paper 39, "Tr."). [1]

The Board has jurisdiction under 35 U.S.C. § 6(c). In this Final Written Decision, issued pursuant to 35 U.S. C. § 318(a) and 37 C.F.R. § 42.73, we determine Petitioner has not shown by a preponderance of the evidence that challenged claims 1–7 are unpatentable.

A. Related Matters

According to Petitioner and Patent Owner, the '004 patent is involved in a case titled *Rohm and Haas Co. v. Organik Kimya San. Ve Tic. A.S.*, Case No. 13-cv-898-RGA, filed in the U.S. District Court for the District of Delaware, currently stayed; and in an investigation at the U.S. International

[1] Petitioner and Patent Owner have filed Objections to Demonstrative Exhibits (Papers 37 and 38). In this Final Written Decision, we have not considered any arguments presented in the demonstrative exhibits that were not presented previously and/or are not supported by the record.

Trade Commission titled *In the Matter of Certain Opaque Polymers*, Inv. No. 337-TA-883 (USITC). Pet. 2–3; Paper 8, 2–3 (Related Matters).

B. The '004 Patent (Ex. 1001)

The '004 patent is directed to a process for preparing multi-stage emulsion polymers having low dry-bulk density that are useful in coating compositions, such as paints and paper coatings. Ex. 1001, Abstract. Emulsion polymers, such as "hollow" or "voided" emulsion polymers, "are generally prepared by swelling a core/shell emulsion polymer in such a way that one or more voids form in the interior of the emulsion polymer particle. These voids contribute, among other things, to the opacity of coatings and films prepared with the hollow emulsion polymer." *Id*. at 1:27–33. In some applications, it is desirable to minimize the weight of an applied coating. *Id.* at 1:34–35. "Accordingly, it is desirable to provide lightweight, low density additives for coatings, such as voided latex particles." *Id*. at 1:39–40. The '004 patent explains that voided latex polymers are prepared by several known processes, such as by swelling the core of a core-shell emulsion polymer. *Id*. at 1:37–45. The '004 patent states:

> The present invention seeks to overcome the deficiencies in the previously known processes by providing low density voided emulsion polymers and a process for preparing them.

Id. at 1:56–58.

Specifically, the '004 patent discloses preparing the multi-stage emulsion polymer by sequential emulsion polymerization, which includes charging the monomers which form the shell. *Id*. at 7:33–35. "At, or near, the conclusion of charging the monomers which form the shell, the contents of the reactor include the multistage polymer, water and unreacted monomer." *Id*. at 7:35–38. Under the conditions of emulsion

polymerization, even if no additional monomer or initiator is added, there is an appreciable free-radical content in the system that keeps the polymerization process going until there is no longer an appreciable free-radical content. *Id*. at 7:38–43. When no appreciable free-radical content remains, no substantial amount of polymerization will occur. *Id*. at 7:43–46.

The '004 patent states: "We have discovered that by providing an aqueous emulsion of the multi-stage emulsion polymer, monomer and swelling agent under conditions wherein there is no substantial polymerization of the monomer, we can enhance the extent of swelling of the multistage emulsion polymer." *Id*. at 7:60–64.

The '004 patent explains that suitable swelling agents may be volatile or fixed bases, or combinations thereof, and "include, are those which, in the presence of the multistage emulsion polymer and monomer, are capable of permeating the shell and swelling the core." *Id*. at 8:43–46.

C. Illustrative Claim

Independent claim 1 of the '004 patent is illustrative of the claims at issue:

> 1. A process for preparing emulsion polymer particles comprising:
>
> (a) providing an aqueous emulsion of
>
> (i) multi-stage emulsion polymer, comprising a core stage polymer and a shell stage polymer, wherein the core stage polymer comprises, as polymerized units, from 5 to 100 percent by weight, based on the weight of the core stage polymer, of hydrophilic monoethylenically unsaturated monomer, and from 0 to 95 percent by weight, based on the weight of the core stage polymer, of at least one nonionic monoethylenically unsaturated monomer; and

> wherein the shell stage polymer comprises, as polymerized units, at least 50 percent by weight of nonionic monoethylenically unsaturated monomer;
>
> (b) adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization;
>
> (c) providing monomer at a level of at least 0.5 percent by weight based on the weight of the multi-stage emulsion polymer;
>
> (d) adding swelling agent; and
>
> (e) reducing the level of monomer by at least fifty percent.

Ex. 1001, 37:14–38:5.

D. The Prior Art

Touda et al., US 5,077,320, issued December 31, 1991 (Ex. 1003) ("Touda").

Toda et al., US 5,360,827, issued November 1, 1994 (Ex. 1004) ("Toda").

Overbeek et al., US 5,292,660, issued March 8, 1994 (Ex. 1005) ("Overbeek").

Crouch, US 2,574,020, issued November 6, 1951 (Ex. 1006) ("Crouch").

E. The Instituted Grounds of Unpatentability

Trial was instituted for Petitioner's challenges claims 1–7 of the '004 patent on the following grounds:

Reference	Basis	'004 Claims Challenged
Touda	§ 103(a)	1–6
Touda and Overbeek	§ 103(a)	7
Toda and Crouch	§ 103(a)	1–7

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable constructions in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC,* 778 F.3d 1271, 1280 (Fed. Cir. 2015). Under the broadest reasonable construction standard, claim terms are presumed to be given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). An inventor may rebut that presumption by providing a definition of the term in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen,* 30 F.3d 1475, 1480 (Fed. Cir. 1994). Stated differently, a "claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002).

The parties' arguments center on the construction of the following claim term and phrase:

1. "swelling agent"

Claim 1 requires the inclusion of a swelling agent in the aqueous emulsion. The Specification states,

> Suitable swelling agents include, are those which, in the presence of the multistage emulsion polymer and monomer, are capable of permeating the shell and swelling the core. Swelling agents may be aqueous or gaseous, volatile or fixed bases or combinations thereof.

> Suitable swelling agents include volatile bases such as ammonia, ammonium hydroxide, and volatile lower aliphatic amines, such as morpholine, trimethylamine, and triethylamine, and the like; fixed or permanent bases such as potassium hydroxide, lithium hydroxide, zinc ammonium complex, copper ammonium complex, silver ammonium complex, strontium hydroxide, barium hydroxide and the like.

Ex. 1001 at 8:44–56. The Specification explains,

> The core polymer of the multistage emulsion polymer swells when the core is subjected to a basic swelling agent that permeates the shell to at least partially neutralize the hydrophilic-functionality of the core, preferably to a pH of at least about 6 to at least about 10, and thereby result in swelling by hydration of the hydrophilic core polymer.

Id. at 9:14–19.

Patent Owner asserts that that a person of ordinary skill in the art would understand from the Specification that the term "swelling agent" means

> an ingredient that is capable of permeating the shell and swelling the core of the multi-stage emulsion polymer (step (a)) in the presence of the swelling monomer (step (c)) under conditions of no substantial polymerization (step (b)), <u>in the process in which the ingredient in question is being employed as a "swelling agent.</u>

PO Resp. 19–20. For example, according to Patent Owner, sodium hydroxide, a fixed base, may be a swelling agent in some processes, while not in others. *Id*. at 20. Patent Owner reasons that such a neutralizing agent "may or may not also be a 'swelling agent' depending on the conditions of the specific process where it is used." *Id*. Patent Owner asserts, "[t]o contend that 'swelling agent' does not have to involve any amount of swelling ignores the functional aspects of the plain and ordinary meaning of

term." *Id*. at 24. Patent Owner's position is supported by the Declaration of Patent Owner's Declarant, F. Joseph Schork, Ph.D. *See* Ex. 2005 ¶¶ 67–69.

Petitioner asserts that the claims do not require the recited "swelling agent" to be an ingredient that "'must be capable of permeating the shell and swelling the core.'" Pet. Reply 4. Petitioner asserts that the Specification "merely identifies exemplary types of swelling agents" without defining or limiting the term. *Id*. at 5. In support of this assertion, Petitioner notes that the Specification uses the term "include" in its description of suitable swelling agents, i.e., "[s]uitable swelling agents *include*, are those which, in the presence of the multistage emulsion polymer and monomer, are capable of permeating the shell and swelling the core," Ex. 1001, 8:44–46 (emphasis added). Pet. Reply 5. According to Petitioner, by using the term "include," the Specification "mak[es] clear that swelling agents that are not capable of permeating the shell and swelling the core also fall within the scope of the invention." *Id*. at 6. Petitioner asserts that Patent Owner's proposed claim construction disregards the Specification's use of the term "include" in an attempt "to change the meaning of the '004 patent disclosure" and to impart impermissibly a "swelling step" into claim 1. *Id*.

We disagree with Petitioner that the Specification's use of the term "include," when describing suitable swelling agents, "mak[es] clear" that bases that are not capable of permeating the shell and swelling the core also fall within the scope of the invention. *Id.* Rather, the Specification's use of the word "include," in this instance, is modified by the phrase immediately following it, i.e., "are those which," suggesting that suitable swelling agents include only those which exhibit the functional characteristic thereafter described. *See* Ex. 1001, 8:44. In contrast, the subsequent paragraph of the

Specification describes the structural requirement for suitable swelling agents using the word "include," without modifying it with a restrictive phrase. Instead, when disclosing the volatile, fixed and permanent bases, the word "include" is coupled with the phrases "such as" and "and the like," signaling open-ended or inclusive categories of these bases. *See id*. at 8:49–56.

Further, we agree with Patent Owner that the Specification describes a swelling agent not merely as being capable of permeating a shell and swelling the core of a multistage emulsion polymer in the abstract, but specifically under the conditions of the specific process for which the agent is to be used. Indeed, the Specification explains that in its process for preparing emulsion polymers, the core polymer of the multistage emulsion polymer swells when it "is subjected to a basic swelling agent that permeates the shell to at least partially neutralize the hydrophilic-functionality of the core." Ex. 1001, 9:14–17.

Based on the foregoing discussion, in light of the '004 patent Specification, we construe the claim term "swelling agent" as expressing a structural element, i.e., "an aqueous or gaseous, volatile or fixed base, or combinations thereof," in functional terms, i.e., "capable of permeating the shell and swelling the core, in the presence of the multistage polymer and monomer, under the conditions of the specific process for which the agent is to be used." *See Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996) (structural elements, e.g., "filter" and "brake," may be expressed in functional terms).

2. "adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization"

Claim 1 requires "adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization." The Specification states that "[w]hen used, the polymerization inhibitors or reducing agents are added in effective amount to substantially stop any polymerization, *generally from 25 to 5,000 parts per million ('ppm'), preferably from 50 to 3,500 ppm based on polymer solids*." Ex. 1001, 8:16–20 (emphasis added).

In our Institution Decision we interpreted the claim phrase "adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization," as including, but not being limited to, adding an amount of polymerization inhibitors or reducing agents generally from 25 to 5,000 ppm, preferably from 50 to 3,500 ppm based on polymer solids, or in amounts exceeding these ranges. Inst. Dec. 7.

Patent Owner asserts "'an effective amount' to 'substantially stop polymerization' . . depends entirely on the specific inhibitor or reducing agent and the specific reaction conditions of the process, including the starting amount of monomer and residual initiator." PO Resp. 18. Therefore, according to Patent Owner, the claim phrase "adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization," is not satisfied unless polymerization is substantially stopped as a result of adding the inhibitor or reducing agent used. *Id*. at 17.

Petitioner asserts that Patent Owner's proposed interpretation "produces an unworkable result," as the Specification does not provide a

quantitative way for determining whether the condition actually exists. Pet. Reply 9. However, the Specification explains that no substantial polymerization exists when there is a depletion of free-radicals. *See* Ex. 1001, 7:43–46 ("When there is no appreciable free-radical content, in other words, when the radical flux is very low or approaches zero, then no substantial amount of polymerization will occur.").

Accordingly, based on the foregoing discussion, in light of the '004 patent Specification, we determine that the broadest reasonable interpretation of the claim phrase "adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization," includes, but is not limited to, adding an amount of polymerization inhibitors or reducing agents generally from 25 to 5,000 ppm, preferably from 50 to 3,500 ppm based on polymer solids, or in amounts exceeding these ranges, and/or wherein no appreciable free-radical content remains in the reactor including the multistage polymer and unreacted monomer.

B. Obviousness over Touda

Petitioner contends that claims 1–6 would have been obvious over Touda (Ex. 1003) under 35 U.S.C. § 103(a). Pet. 5, 20–29. Touda discloses:

> A process for producing polymer particles containing one microvoid or two or more discrete microvoids, which comprises (1) adding a base to a latex of a carboxyl-modified copolymer containing 0.1 to 1000 parts of an organic solvent per 100 parts by weight of the carboxyl-modified copolymer to neutralize at least part of the carboxyl groups in the copolymer, and (2) adding an acid to the latex to adjust the pH of the latex to not more than 7.

Ex. 1003, Abstract.

Touda explains that:

> [T]he present inventors have found that if the polymer particles are swollen with a base in the presence of an organic solvent, microvoid-containing polymer particles can be obtained easily with a short period of time, and microvoid-containing particles of a polymer having a high glass transition temperature can be obtained, and that this process can also give polymer particles having a plurality of microvoids.

Id. at 2:41–48.

Further, Touda teaches that "[t]here is no particular limitation on the method of obtaining polymers containing carboxyl groups," and discloses that the method may include copolymerizing carboxyl-containing monomers, which "is advantageous to production." *Id*. at 2:66–3:4. Touda discloses that exemplary carboxyl-containing monomers that can be used in the invention include ethylenically unsaturated carboxylic acids, such as methacrylic acid, and that exemplary monomers, which are copolymerizable with carboxyl-containing monomers, include aromatic vinyl monomers, such as styrene. *Id*. at 3:5–8, 25–29.

Additionally, Touda teaches that "[t]here is no particular restriction on the method of including an organic solvent in the carboxyl-modified copolymer latex," and the method may, for example, involve adding an organic solvent to a latex obtained by polymerization. *Id*. at 3:61–64. The organic solvent used in the invention also is not particularly limited, as long as it "can fully swell the copolymer particles." *Id*. at 3:66–4:1. Touda discloses specific examples of solvents, including toluene. *Id*. at 4:1–3.

Petitioner asserts that Touda discloses each and every element of claim 1 of the '004 patent. Pet. 20. According to Petitioner, "*Touda*

expressly discloses all but two of the elements of claim 1 of the '004 patent in a single example – Example 2 (combination of Examples 1S, 2A and 2B)." *Id*. at 20 (citing Ex. 1002 ¶ 55). Petitioner asserts that the two elements not disclosed in Touda Example 2 are taught expressly elsewhere in the disclosure of Touda. *Id*.

Touda discloses in Example 1S the "[s]ynthesis of a seed latex," comprising: placing 300 parts of deionized water in a reactor, along with 95 parts of styrene (i.e., 95% of a nonionic monoethylenically unsaturated monomer), and 5 parts of MAA (i.e., 5% of a hydrophilic monoethylenically unsaturated monomer); heating and stirring the mixture; allowing the temperature of the mixture to reach 70° C and then adding 17 parts of a 3% aqueous solution of potassium persulfate; and maintaining the reaction mixture at 70° C for three hours to complete the polymerization reaction, resulting in a polymerization conversion of 99%. Ex. 1004, 6:33–49; Pet. 36.

Touda discloses in Example 2A the "[p]roduction of a filled polymer latex in the presence of an organic solvent," comprising charging the same reactor used in the production of the seed latex with 508 parts of deionized water, 3.4 parts of seed latex [S]; heating the contents to 80° C; adding 30 parts of a 3% aqueous solution of potassium persulfate; adding a mixture of a monomeric mixture composed of 87.7 parts of styrene (i.e., at least 50% by weight of nonionic monoethylenically unsaturated monomer), 0.3 parts of divinylbenzene, 5 parts of methyl methacrylate and 7 parts of MAA and *10 parts of toluene* over 6 hours; and then maintaining the mixture at 80° C for 2 hours to complete the polymerization reaction. Ex. 1004, 7:35–56.

Touda discloses in Example 2B the production of a microvoid-containing latex, comprising: charging the same reactor used in the production of the seed latex with 870 parts of deionized water, 100 parts of the filled polymer latex, 1 part of sodium dodecyl-benzenesulfate, 50 parts of *toluene*, and 33 parts of a 10% aqueous solution of sodium hydroxide; stirring the mixture at 80° C for three hours; adding 300 parts of a 1% aqueous solution of hydrochloric acid; stirring the mixture at 80° C for 3 hours; cooling the reaction mixture to room temperature; and removing the organic solvent under reduced pressure. *Id*. at 7:58–62; *see also id*. at 7:4–24.

Petitioner asserts that although Touda Example 2 does not expressly disclose adding an effective amount of one or more polymerization inhibitors to substantially stop any polymerization, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the process of Touda's Example 2A by substituting 10 parts of cresol, an organic solvent and polymerization inhibitor, in place of the disclosed 10 parts of toluene organic solvent. Pet. 23. Petitioner reasons that the artisan would have been motivated to make this modification because Touda teaches that there is no particular restriction on the type of organic solvent used, and explicitly discloses cresol as an exemplary organic solvent. *Id*. at 22 (citing Ex. 1003, 3:61–63,4:7).

Patent Owner asserts a person of ordinary skill in the art would have understood that cresol is an inhibitor, and that substituting it for toluene in Touda's Example 2A would have "shut down the polymerization reaction." PO Resp. 41 (citing Ex. 2005 ¶ 128). Patent Owner asserts that in Example 2A, toluene is added as part of a mixture including monomers during a "6-

hour polymerization step that results in the formation of the shell polymer as part of a 'filled polymer latex.'" *Id*. at 41 (citing Ex. 1003, 7:34–55). Therefore, Patent Owner asserts that a person of ordinary skill in the art would not use cresol, a polymerization inhibitor, in place of toluene, during this step because doing so would prevent polymerization and formation of the shell polymer. *Id*. (citing Ex. 2005 ¶ 128).

Petitioner acknowledges that substituting cresol for toluene "shortstops the polymerization reaction." Pet. Reply 2–3. However, Petitioner asserts that doing so does not prevent the formation of a multistage polymer particle. *Id*. In support of this assertion, Petitioner relies on experimental results detailed in the Declaration of Dr. Schork, Patent Owner's witness. According to Petitioner, Dr. Schork's experiment involving substituting cresol for toluene in Touda's Example 2A, "confirms that a meaningful amount of shell stage polymer (approximately 17 wt. % based on wt. % of the multi-stage polymer particle) was formed." *Id*. at 3 (citing Ex. 2005 ¶ 128, Ex. I), 13 (citing Ex. 1001, 7:24–27).

After considering the arguments and evidence, we find that Patent Owner has established that a person of ordinary skill in the art would not have been motivated to substitute cresol for toluene in step 2A of Touda's Example 2. Although cresol and toluene are both solvents, Patent Owner has established with persuasive evidence that cresol's additional function as a polymerization inhibitor would have defeated the purpose of the solvent in Touda's step 2A. That step is directed to the production of a filled polymer latex (multi-stage polymer). Ex. 1003, 7:35–56. During step 2A, toluene was added to a monomeric mixture over the course of 6 hours. *Id*. at 7:49–50. Then the mixture was maintained at 80 °C for 2 hours to complete the

polymerization reaction. *Id*. at 7:51–52.

Dr. Schork attempted to replicate Example 2 with cresol substituting for toluene during step 2A, as proposed by Petitioner. Ex. 2005 ¶¶ 92–95 (citing Declaration Ex. I, "Synthesis Procedure for Touda '320 Example 2 Modified"). Dr. Schork explained that the result observed from using cresol during step 2A was not surprising: "monomer was only 2.5% converted to polymer after the required eight hours." *Id*. ¶ 95. Dr. Schork stated, "[i]n my opinion, these results show that the modified process of Example 2A does not make a core-shell emulsion polymer having a core stage and a shell stage because the cresol inhibits polymerization during the phase intended to make the shell." *Id*. Petitioner's assertion to the contrary—that Dr. Schork's experiment produced "a meaningful amount of shell stage polymer,"—is merely attorney argument unsupported by any persuasive evidence. Pet. Reply 13. Indeed, Petitioner's Declarant, Marek W. Urban, Ph.D., did not attempt to replicate Example 2 with the modifications proposed by Petitioner, i.e., substituting cresol for toluene in Step 2A.

Accordingly, we conclude that Petitioner has not established that it would have been obvious to modify Touda's Example 2 to include a polymerization inhibitor.

Moreover, we agree with Patent Owner that Touda's Example 2 also does not include a swelling agent, as required by claim 1 of the '004 patent. PO Resp. 28. In particular, as Patent Owner asserts, Touda does not disclose expressly sodium hydroxide, or any other base, as a "swelling agent," i.e., being capable of permeating the shell and swelling the core of the emulsion polymer under the conditions of Example 2. *Id*.

Petitioner asserts that even if our construction of "swelling agent"

requires a base that permeates the shell and swells the core, Petitioner "has established a *prima facie* case of inherency under Office practice." Pet. Reply 10 (citing *In re Best*, 562 F.2d 1252, 1254 (C.C.P.A. 1977); *In re Spada*, 911 F.2d 705, 707–08 n.3 (Fed. Cir. 1990); *In re Mousa*, 479 F. App'x. 348, 353 (Fed. Cir. 2012)), 14. According to Petitioner, sodium hydroxide inherently permeates the shell and swells the core of the polymer particles in Touda because the same polymer particles are described in the '004 patent as suitable for swelling. Pet. Reply 14.

However, Dr. Schork explains that in Touda's Example 1S, the core is only 5 parts (5%) methacrylic acid and the shell in Example 2A is only 6 parts (6%) acrylic acid, such that the core and the shell are only slightly acidic. Ex. 2005 ¶ 77. Dr. Schork states that a person of skill in the art "would understand that under these conditions, NaOH would at best neutralize the shell, not the core." *Id*. According to Dr. Schork, "[g]iven the low levels of acid, the NaOH would be unlikely to permeate and neutralize any part of the particle. Certainly, NaOH would not permeate the shell and swell the core. Instead, to the extent that any swelling occurred, it would take place in the shell." *Id*. Again, we are persuaded by Dr. Schork's testimony and do not find that Petitioner has provided persuasive evidence contradicting Dr. Schork's opinion.

Accordingly, after considering the arguments and evidence, and based upon our construction of the term "swelling agent," we find that Petitioner has not established that Touda discloses sodium hydroxide as a "swelling agent" in the process of Example 2.

Based on the foregoing discussion and the record, we conclude that Petitioner has not shown by a preponderance of the evidence that claims 1–6 would have been obvious over Touda under 35 U.S.C. § 103(a).

C. Obviousness over Touda and Overbeek

Petitioner contends that claim 7 would have been obvious over Touda and Overbeek under 35 U.S.C. § 103(a). Pet. 6, 29–30. Claim 7 recites, "The process of claim 1 wherein the level of monomer is reduced to less than 10,000 ppm based on polymer solids by polymerizing said monomer." Petitioner asserts that Touda teaches or suggests each element of independent claim 1, and combines Overbeek with Touda to teach the further limitation of dependent claim 7, i.e., that the level of monomer in the emulsion is "reduced to less than 10,000 ppm based on polymer solids by polymerizing said monomer." Pet. 18, 29.

Because Petitioner relies on Touda as teaching or suggesting adding a "swelling agent" and one or more "polymerization inhibitors," in the same manner set forth regarding claim 1, we conclude that Petitioner has not shown by a preponderance of the evidence that claim 7 would have been obvious over Touda and Overbeek under 35 U.S.C. § 103(a).

D. Obviousness over Toda and Crouch

Petitioner asserts that claims 1–7 would have been obvious over Toda (Ex. 1004) and Crouch (Ex. 1006) under 35 U.S.C. § 103(a). Pet. 6, 38–46.

Toda discloses:

> A process for preparation of latex of a hollow polymer which comprises adding a base, in the presence of a monomer, to latex containing carboxy-modified copolymer particles to make the pH of the latex 8 or more; adding a carboxyl group-containing monomer to make the pH of the latex 7 or less; and then polymerizing these monomers.

Ex. 1004, Abstract.

In Example 11, Toda discloses a process for obtaining a latex containing polymer particles comprising the steps of forming a center layer, an intermediate layer, and a surface layer. *Id*. at 11:59–68; 12:13–37; 12:61–68; 13:1–2; Table 2. The center layer was formed by placing in a reactor 400 parts of deionized water, 0.3 part of monomer mixture (a)(i.e., 70% of methyl methacrylate ("MMA")), 5% of butyl acrylate ("BA") and 25% of MAA, and 0.3 part of an emulsifier; heating the mixture to 80° C and stirring to prepare an emulsion; adding 7 parts of aqueous 3% potassium sulfate ("KPS") solution; subjecting the mixture to polymerization at 80° C for 0.5 hour to obtain seed particles; adding 0.5 part of an emulsifier; continuously adding the residual monomer mixture (a) over a period of one hour; and carrying out polymerization for 2 hours, resulting in a conversion of monomer mixture (a) of 98%. *Id*. An intermediate layer was formed by adding to the reactor 7 parts of KPS; continuously adding monomer mixture (b) (i.e., 87% of MMA, 10% of BA and 3% of MAA); and carrying out polymerization for 4 hours, resulting in a conversion of mixture (b) of 98%. The surface layer was formed by adding 7 parts of KPS to the reactor; continuously adding a monomer (c), i.e., 100% of styrene; and carrying out polymerization for 4 hours, lowering the temperature to 20° C to obtain latex-containing polymer particles, wherein the conversion of monomer mixture (c) was 98%. *Id*.

Toda further discloses in Example 11: (i) adding 3 parts of styrene to the obtained latex containing polymer particles to soften the particles; adding aqueous 10% potassium hydroxide solution and heating to 80° C for 3 hours (base treatment); (ii) adding 80 parts of aqueous MAA and 50 parts

of styrene and stirring the mixture at 80° C for 3 hours (acid treatment); and (iii) adding 10 parts of aqueous 3% KPS solution, stirring the mixture of unreacted monomers at 80°C for 2 hours to carry out copolymerization, resulting in a polymerization conversion at this final stage of 99%. *Id*. at 12:38–59,Table 2.

Petitioner asserts that Toda discloses, in at least Example 11, each and every element of claims 1–7 of the '004 patent, except for adding a polymerization inhibitor. Pet. 39–41. Petitioner asserts that Toda, "however, teaches that '[w]hen it is desired to make a base treatment at a lower temperature, it is sufficient to lower polymerization conversion' and suggests polymerization conversions of 83% to 99%." *Id*. at 41 (citing Ex. 1004, 6:43–48). Toda does not specifically explain how to lower the polymerization conversion, but Petitioner asserts that Crouch discloses "adding hydroquinone [a polymerization inhibitor] or other novel reducing agents to a polymerizing emulsion to substantially stop polymerization after a desired degree of polymerization has been obtained." *Id*. (citing Ex. 1002 ¶¶ 88–89). Petitioner contends, therefore, that in view of the combined teachings of Toda and Crouch, it would have been obvious to one of ordinary skill in the art to add hydroquinone in the process of Toda's Example 11 to shortstop the emulsion polymerization, lower the monomer conversion, and to lower the temperature during which the base treatment is conducted by adding hydroquinone, as taught by Crouch. *Id*. at 42.

Based on our construction of the term "swelling agent," and in consideration of the arguments and evidence, we find that the Petitioner has not established persuasively that the process disclosed in Toda's Example 11 includes adding a "swelling agent." According to Petitioner, in Example 11,

"[i]mmediately after the 'softening step,' aqueous potassium hydroxide solution was added as a swelling agent." Pet. 43. Petitioner supports this position by referring to Toda's disclosure of adding potassium hydroxide solution in the process of Example 11, Pet. 43 (citing Ex. 1004, 12:40–43, Table 2) and the testimony of Petitioner's Declarant, Dr. Urban, who explains that potassium hydroxide "is a fixed base expressly identified by the '004 patent as a possible swelling agent" (Ex. 1002 ¶ 92)).

In the Response, Patent Owner asserts that Toda does not describe potassium hydroxide as being "capable of permeating the shell and swelling the core" of the multi-stage emulsion polymer prepared by Example 11. PO Resp. 33. Further, Patent Owner asserts that a person of ordinary skill in the art would not understand the potassium hydroxide disclosed in Toda to be a "swelling agent." *Id*. (citing Ex. 2005 ¶ 99). In Toda's Example 11, the reaction temperature is lowered to 20 °C before adding the potassium hydroxide. *Id*. (citing Ex. 1004, 12:34–36). According to Dr. Schork, a person of ordinary skill in the art would understand that at that temperature, the polystyrene shell would be too hard for potassium hydroxide to permeate it. Ex. 2005 ¶¶ 100, 149. Additionally, Dr. Schork explained that a person of ordinary skill would understand that after the reaction is heated back up to 80 °C, the shell would still be too rigid for potassium hydroxide "to permeate under the conditions of the base treatment with '3 parts of styrene.'" *Id*. ¶149.

Further, Patent Owner asserts that Dr. Schork's attempt to replicate the process of Example 11 confirms that the added potassium hydroxide is not a "swelling agent." *Id*. at 33, 56 (citing Ex. 2005 ¶¶ 117–120). According to Dr. Schork, his replication of Example 11, incorporating the

modification proposed by Petitioner (i.e., adding hydroquinone to shortstop the reaction monomer mixture (c)), provided "no evidence of swelling during the base treatment step." Ex. 2005 ¶147.

In its Reply, Petitioner argues that even if our construction of "swelling agent" requires a base that permeates the shell and swells the core, Toda discloses such a system. Pet. Reply 14. According to Petitioner, potassium hydroxide inherently permeates the shell and swells the core of the polymer particles in Toda because the same polymer particles are described in the '004 patent as suitable for swelling. *Id*.

As discussed previously, we have construed the claim term "swelling agent" as encompassing a structure, i.e., a base, and a function, i.e., being capable of permeating the shell and swelling the core, in the presence of the multistage polymer and monomer, under the conditions of the specific process for which the agent is to be used. We are not persuaded by Petitioner's assertion that potassium hydroxide permeates the shell and swells the core of the polymer particles in Toda merely because the same polymer particles are described in the '004 patent as suitable for swelling. Pet. Reply 14. In Toda's Example 11, the potassium hydroxide was added to the mixture after the temperature of the mixture was lowered to 20° C and styrene was added to soften the polymer particles. Ex. 1004, 12:38–42. Patent Owner provides persuasive evidence, through the Declaration of Dr. Schork, that a person of ordinary skill in the art would have understood that the shell would be too hard at this temperature for potassium hydroxide to be capable of permeating the shell and swelling the core. PO Resp. 33–34 (citing Ex. 2005 ¶ 100). Petitioner has not argued persuasively otherwise. *See, e.g.*, Pet. Reply 13–14.

Further, in Toda's Example 11, after adding the potassium hydroxide, the mixture is heated to 80 °C. Ex. 1003, 12:41–44. Patent Owner provides persuasive evidence, also through the Declaration of Dr. Schork, that based on the teachings of Toda, a person of ordinary skill in the art would not expect potassium hydroxide to permeate the shell and swell the core at that temperature either. PO Resp. 34 (citing Ex. 2005 ¶ 100). Petitioner has not argued persuasively otherwise. *See*, *e.g.*, Pet. Reply 13–14.

Additionally, Patent Owner provides persuasive experimental evidence that the potassium hydroxide solution used in Toda's Example 11 is not capable of permeating the shell and swelling the core. *See* PO Resp. 33, 36, 56 (citing Ex. 2005 ¶¶ 117–120). Dr. Schork replicated Toda's Example 11, incorporating the modification proposed by Petitioner, i.e., adding hydroquinone to shortstop the reaction monomer mixture (c). Ex. 2005 ¶¶ 117–118. Dr. Schork explained that after the potassium hydroxide was added, "the heating of the reactor back to 80 °C was initiated, but was not achieved because the entire reactor gelled to a viscous mass that could not be stirred." *Id*. ¶ 119. Dr. Schork stated, "TEM [transition electron microscopy] data of the final product and in-process samples ([Declaration] Ex. P) confirms that modified Example 11 did not result in voided or swollen emulsion particles." *Id*. ¶ 120. Indeed, according to Dr. Schork, modified Example 11 did not even produce multi-stage emulsion particles with a separate core and shell. *Id*. Dr. Schork concluded, "Based on my replication of Example 11, including analysis of the TEM images, there is no evidence of swelling during the base treatment step." Ex. 2005 ¶147.

Petitioner has not provided any experimental data or evidence contradicting Dr. Schork's results and findings.

Accordingly, after considering the arguments and evidence, and based upon our construction of the term "swelling agent," we find that Petitioner has not shown that Toda discloses potassium hydroxide as a "swelling agent" in the process of Example 11.

Based on the foregoing discussion and the record, we conclude that Petitioner has not shown by a preponderance of the evidence that Toda and Crouch render obvious claims 1–7.

III. MOTION TO AMEND

Patent Owner's Motion to Amend is contingent on claims of the '004 patent being held unpatentable. Mot. Amend 1. Because these claims are not held to be unpatentable, there is no occasion to reach or decide the motion to amend.

IV. CONCLUSION

Petitioner has not demonstrated by a preponderance of the evidence that claims 1–7 instituted for *inter partes* review are unpatentable under 35 U.S.C. § 103(a) as obvious over Touda, Touda and Overbeek, or Toda and Crouch.

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner's request for cancellation of claims 1–7 of the '004 patent is *denied*;

FURTHER ORDERED that Patent Owner's Motion to Amend is *dismissed* as moot; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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