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Not Just a Base, Use of "Swelling Agent" in a Claim for Emulsion Polymerization Patents: A Lesson from *Organik Kimya AS v. Rohm & Haas Co.*

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ABSTRACT

Rohm & Haas Co. successfully defended the validity of their patents for manufacturing a core-shell polymer in *Organik Kimya AS v. Rohm & Haas Co.*, 873 F.3d 887 (Fed. Cir. 2017). Relying on the specification and expert testimony, the Federal Circuit construed a key claim term, "swelling agent," as a base capable of permeating the shell to swell the core. The construction distinguished the swelling agent from the same base use in the prior art. This article is intended to explore the Federal Circuit's reasoning. In conclusion, two lessons can be learned from *Organik Kimya AS*. First, a claim may recite a functional description (*e.g.*, "swelling agent") to describe an ingredient (*e.g.*, potassium hydroxide). Second, the specification must describe a mechanism achieved by the function of the ingredient. Process conditions affecting the mechanism must also be specified. So, the same ingredient used in the claimed invention and prior art can be distinguishable because of different mechanisms involved.

I. INTRODUCTION

Emulsion polymerization is a technique used for some radical chain or free-radical polymerization.[1] An emulsion polymerization system is a solution consisting of monomer(s), dispersing medium (*e.g.*, water), emulsifier (also known as surfactant or soap), and water-soluble initiator.[2] When the concentration of an emulsifier exceeds its critical micelle concentration (CMC), the excessive emulsifier molecules aggregate to form small colloidal clusters (also known as micelles).[3] When a water-insoluble or slightly water-soluble monomer is added into the system, a very small portion dissolves in the continuous aqueous phase.[4] Another small portion enters into the micelles.[5] The remaining portion, the largest one, is dispersed as monomer droplets that are stabilized by absorbing emulsifier molecules on their surfaces.[6] Finally, after an initiator is added, radical chain polymerization starts with transforming an initiator into a free radical molecule which reacts with monomer molecules.[7]

There are three major mechanisms in emulsion polymerization.[8] The first mechanism is called

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[1] *See* George Odian, Principles of Polymerization 335 (John Wiley & Sons, Inc. 3rd ed. 1991); *see also* A.M. van Herk and R.G. Gilbert, *Emulsion Polymerisation*, *in* Chemistry and Technology of Emulsion Polymerisation 43, 44 (A.M. van Herk ed., John Wiley & Sons, Ltd. 2013); Christopher D. Anderson and Eric S. Daniels, Emulsion Polymerisation and Applications of Latex 5 (Rapra Technology Ltd. 2003), *available at* http://www.polymerjournals.com/pdf download/890775.pdf (last visited Feb. 23, 2019).
[2] *See* Odian, *supra* note 1, at 336.
[3] *See id.* at 337.
[4] *See id.*
[5] *See id.*
[6] *See id.*
[7] *See id.* at 338.
[8] *See* Mamoru Nomura, Hidetaka Tobita, and Kiyoshi Suzuki, *Emulsion Polymerization: Kinetic and Mechanistic Aspects*, *in* Polymer Particles 1, 4 (Advances in Polymer Science Vo1. 175) (Masayoshi Okubo ed., Springer-Verlag Berlin Heidelberg 2005).

"micellar nucleation," where an initiator becomes a free radical in the aqueous phase, then enters a micelle to react with monomer molecules therein.[9] The second mechanism is called "homogeneous nucleation," where the radical chain reaction between an initiator and monomer occurs in the aqueous phase until the polymer reaches its solubility limit and then precipitates.[10] The third mechanism is called "droplet nucleation," where the free-radical polymerization happens in a monomer droplet because a free radical enters from the aqueous phase.[11]

Rohm & Haas Co. ("Rohm"), a Philadelphia-based company established in 1909, developed an emulsion polymerization process for manufacturing hollow emulsion polymers.[12] Ropaque was a line of Rohm's opaque polymers since the late 1970s.[13] In the late 1990s, after years of development, Rohm created Ropaque Ultra, a new line of opaque polymers with improved opacity.[14] The new technology was described in U.S Patent Nos. 6,020,435 ('435 Patent) and 6,252,004 ('004 Patent) that provide methods for "preparing certain emulsion polymers having improved opacity [and being] in opaque coatings such as paints, coatings, inks, and other products benefitting from opacity."[15]

In 2009, Rohm was acquired by Dow Chemical Co. ("Dow").[16] Dow then became a leading player in the opaque polymer market.[17] However, while Ropaque Ultra had become dominant in the opaque polymer market, Organik Kimya AS ("Organik"), a Turkish company, was trying to enter the same market.[18] From 2008 to 2013, Organik hired Rohm's prior employees to learn the trade secret of manufacturing Ropaque Ultra products.[19]

On May 20, 2013, Dow and Rohm filed a complaint with the U.S. International Trade Commission (ITC) under section 337 of the Tariff Act of 1930 asserting that Organik infringed Rohm's four patents.[20] Later, Dow and Rohm withdrew two patents from the proceeding.[21] The '435 Patent and '004 Patent were the only asserted patents.[22] Meanwhile, a parallel pending patent litigation concerning the same patents between the same parties was stayed in the United States District Court for the District of Delaware.[23]

During the ITC proceeding, Dow and Rohm learned of Organik's misappropriation of Rohm's trade secret.[24] In 2016, Dow and Rohm launched a trade secret law suit against Organik in a Delaware state court.[25] The trade secret litigation is pending.[26]

[9] *See id.*
[10] *See id.*
[11] *See id.*
[12] *See* Ros Azlinawati Ramli, *Hollow Polymer Particles: A Review*, 7 RSC ADVANCES 52632, 52641 (2017), *available at* https://pubs.rsc.org/en/content/articlepdf/2017/ra/c7ra10358a (last visited Feb. 21, 2019); *see also* Craig R. McCoy, *New Board Named to Help Guide Philadelphia Media Network*, THE INQUIRER, May 13, 2015, https://www.philly.com/philly/news/20150514_New_board_named_to_help_guide_Philadelphia_Media_Network.html (last visited Feb. 24, 2019).
[13] *See Dow Chem. Co. v. Organik Kimya Holding A.S.*, No. CV 12090-VCG, 2018 WL 2382802, at *2 (Del. Ch. May 25, 2018) [hereinafter *Dow II*].
[14] *See id.*
[15] *See Organik Kimya AS v. Rohm & Haas Co.*, 873 F.3d 887, 889 (Fed. Cir. 2017) (citing U.S Patent No. 6,020,435 col.1 ll.21–25).
[16] *See* Ernest Scheyder, *Dow Will Not Buy Rohm & Haas by Tuesday Deadline*, NBC10 PHILADELPHIA, Jan. 26, 2009, https://www.nbcphiladelphia.com/news/business/Dow-Will-Not-Buy-Rohm–Haas-by-Tuesday-Deadline.html (last visited Feb. 24, 2019); *see also* Ana Campoy, *Dow Chemical Closes Rohm & Haas Deal*, WALL ST. J., Apr. 2, 2009, https://www.wsj.com/articles/SB123860746676278981 (last visited Feb. 24, 2019).
[17] *See Dow II*, 2018 WL 2382802, at *1; *see also Organik Kimya San. Ve Tic., A.Ş. v. Int'l Trade Comm'n*, 848 F.3d 994, 996–97 (Fed. Cir. 2017).
[18] *See Dow Chem. Co. v. Organik Kimya Holding A.S.*, No. CV 12090-VCG, 2017 WL 4711931, at *2–*3 (Del. Ch. Oct. 19, 2017) [hereinafter *Dow I*].
[19] *See Dow II*, 2018 WL 2382802, at *2–*3.
[20] *See* Notice of Institution of Investigation at 1, *In the Matter of Certain Opaque Polymers*, USITC Inv. No. 337-TA-883 (U.S. Int'l Trade Comm'n June 18, 2013), *available at* https://www.usitc.gov/secretary/fed_reg_notices/337/337_883_notice06182013sgl.pdf (last visited Feb. 22, 2019); *see also* Order No. 13: Construing Terms of the Asserted Patents, *In the Matter of Certain Opaque Polymers*, USITC Inv. No. 337-TA-883, 2014 WL 31478, at *2 (U.S. Int'l Trade Comm'n Jan. 2, 2014). The section 337 proceeding provides a forum for a patentee to stop infringing goods from entering into the United States at the border. *See generally* Merritt R. Blakeslee, *Post-Litigation Enforcement of Remedial Orders Issued by the U.S. International Trade Commission in Section 337 Investigations*, 8 J. MARSHALL REV. INTELL. PROP. L. 248 (2009).
[21] *See* Complainants' Unopposed Motion for Partial Termination by Withdrawal of U.S. Patent Nos. 7,435,783 and 7,803,878 (filed Nov. 15, 2013), 2013 WL 6221448, at *1, *In the Matter of Certain Opaque Polymers*, USITC Inv. No. 337-TA-883 (2013) [hereinafter Withdrawal Motion].
[22] *See id.*
[23] *See id.*
[24] *See Dow II*, 2018 WL 2382802, at *2.
[25] *See Dow I*, 2017 WL 4711931, at *7.
[26] *See Dow II*, 2018 WL 2382802, at *1.

On the other hand, Organik filed two separate *inter partes* reviews (IPRs) against the '435 Patent on November 21, 2013,[27] and the '004 Patent on January 14, 2014.[28] The Patent Trial and Appeal Board (PTAB) instituted two separate IPRs of the '435 Patent on May 30, 2014,[29] and the '004 Patent on July 17, 2014.[30]

On April 17, 2015, Dow and Rohm won an ITC limited exclusion order prohibiting Organik's products which unlawfully used Rohm's trade secrets from entering into the United States for 25 years.[31] In the same year, the PTAB found both challenged patents valid in two decisions issued on May 27 and June 26, respectively.[32]

Organik appealed the ITC's and PTAB's decisions to the United States Court of Appeals for the Federal Circuit.[33] On February 15, 2017, the Federal Circuit affirmed the ITC's limited exclusion order.[34] Later on October 11, the Federal Circuit in *Organik Kimya AS v. Rohm & Haas Co.* upheld the PTAB's decisions.[35] Without any petition to the Supreme Court, the issues of patent validity and limited exclusion order have been finalized.[36]

In *Organik Kimya AS*, the Federal Circuit found the patents-in-suit valid mainly because a disputed claim term, "swelling agent," was construed as a base capable of permeating the shell of an emulsion polymer to swell the core.[37] The claim construction relied on the specification and expert testimony, and it prevented the swelling agent from being anticipated by a base that was used in the prior art.[38] Therefore, this article is intended to explore the Federal Circuit's reasoning and to derive practical thoughts on patent drafting.

In this article, Part II introduces the patented technology and validity issues. Part II also analyzes the *Organik Kimya AS* decision. Part III then discusses what can be learned from *Organik Kimya AS* to improve patent drafting for purposes of distinguishing a claim reciting an emulsion polymerization from a prior art even though the same ingredient is used in both technologies.

II. ANALYSIS OF *ORGANIK KIMYA AS V. ROHM & HAAS CO.*

A. *Patented technology*

The '435 Patent and '004 Patent were the patents-in-suit in *Organik Kimya AS*.[39] The '004 Patent was a divisional application of the '435 Patent,[40] so both patents shared an identical specification.[41]

The patented technology was related to hollow emulsion polymers.[42] It was used to produce voided latex particles that are lightweight, low density additives for improving the performance of paper coatings without adding much weight.[43] Voided latex particles were traditionally "prepared by swelling the core of a core-shell emulsion polymer."[44]

[27]*See* Scott Daniels, *RPX Takes on Four Virnetx Patents, Week of November 18, 2013*, US PTO Litigation Alert, Nov. 25, 2013, http://blog.whda.com/2013/11/rpx-takes-on-four-virnetx-patents-week-of-november-18-2013/ (last visited Mar. 15, 2019).

[28]*See* U.S Patent and Trademark Office, Official Gazette of the United States Patent and Trademark Office Vol. 1400 No. 1 (Mar. 4, 2014) (AIA Trial Proceedings Filed before the Patent Trial and Appeal Board), https://www.uspto.gov/web/offices/com/sol/og/2014/week09/TOC.htm (last visited Mar. 15, 2019). The *inter partes* review is a post-grant procedure for reviewing the validity of a patent. *See generally* Matthew R. Frontz, *Staying Litigation Pending Inter Partes Review and the Effects on Patent Litigation*, 24 Fed. Circuit B.J. 469 (2015).

[29]*See* Decision on Institution of *Inter Partes* Review, *Organik Kimya AS v. Rohm & Haas Co*., IPR2014-00185, 2014 WL 2511574, at *1 (Patent Tr. & App. Bd. May 30, 2014) (examining U.S Patent No. 6,020,435).

[30]*See* Decision on Institution of *Inter Partes* Review, *Organik Kimya AS v. Rohm & Haas Co.*, IPR2014-00350, 2014 WL 3590038, at *1 (Patent Tr. & App. Bd. July 17, 2014) (examining U.S Patent No. 6,252,004).

[31]*See generally* Limited Exclusion Order, *In the Matter of Certain Opaque Polymers*, USITC Inv. No. 337-TA-883 (U.S. Int'l Trade Comm'n Apr. 17, 2015), *available at* https://www.usitc.gov/intellectual_property/exclusion_orders/337-ta-883_0.pdf (last visited Mar. 16, 2019).

[32]*See Organik Kimya AS v. Rohm & Haas Co.*, IPR2014-00185, 2015 WL 3430121, at *1 (Patent Tr. & App. Bd. May 27, 2015) (examining U.S Patent No. 6,020,435) [hereinafter *Organik Kimya AS IPR1*]; *see also Organik Kimya AS v. Rohm & Haas Co.*, IPR2014-00350, 2015 WL 3982308, at *1 (Patent Tr. & App. Bd. June 26, 2015) (examining U.S Patent No. 6,252,004) [hereinafter *Organik Kimya AS IPR2*].

[33]*See Organik Kimya AS v. Rohm & Haas Co.*, 873 F.3d 887, 889 (Fed. Cir. 2017); *see also Organik Kimya San. Ve Tic., A.Ş. v. Int'l Trade Comm'n*, 848 F.3d 994, 996 (Fed. Cir. 2017) [hereinafter *Organik Kimya ITC*].

[34]*See Organik Kimya ITC*, 848 F.3d at 994, 996.

[35]*See Organik Kimya AS v. Rohm & Haas Co.*, 873 F.3d 887, 889 (Fed. Cir. 2017); *see also* Laura C. Whitworth, *2017 Patent Law Decisions of the Federal Circuit*, 67 Am. U. L. Rev. 1141, 1250 (2018).

[36]No information on such petition is found in the Westlaw database or Google search.

[37]*See Organik Kimya AS*, 873 F.3d at 891–92.

[38]*See id.* at 896.

[39]*See id.* at 889.

[40]*See* U.S Patent No. 6,252,004 col.1 ll.5–8.

[41]*See Organik Kimya AS*, 873 F.3d at 889 n.2.

[42]*See id.* at 889.

[43]*See* U.S Patent No. 6,020,435 col.1 l.32–col.2 l.12.

[44]*See id.* at col.1 ll.44–45.

However, the traditional preparation was time consuming.[45] The patented technology was invented to improve the efficiency.[46]

The patented technology had two main processes.[47] The first process was to produce a core-shell emulsion polymer by using emulsion polymerization to form a core polymer and then a shell polymer covering the core polymer.[48] The second process was to mix the core-shell emulsion polymer with a monomer and swelling agent in an aqueous emulsion to enhance swelling of the core polymer.[49] During the swelling, no substantial polymerization of the monomer was achieved by using polymerization inhibitors (or reducing agents).[50]

The second process was considered as an improvement in the field of the invention.[51] Particularly, the swelling agent was a key ingredient for forming the core polymer of the emulsion polymer.[52] "Swelling agent" was defined as "those which, in the presence of the multistage emulsion polymer and monomer, are capable of permeating the shell and swelling the core."[53]

Moreover, the specification of the '435 Patent explained that a basic swelling agent "permeates the shell [polymer] to at least partially neutralize the hydrophilic-functionality of the core [polymer], 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."[54] The specification also described that voids in an emulsion polymer are formed by drying the swollen emulsion polymer to remove water or swelling agents from the central region of the emulsion polymer.[55] But, the expansion of the core polymer was believed to depend on the size of the shell polymer after the drying step.[56]

Finally, the '435 Patent and '004 Patent took different approaches to claim the patented technology.[57] Claim 1 of the '435 Patent recited:

> 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, … ;
> (ii) monomer at a level of at least 0.5 percent by weight based on the weight of the multi-stage emulsion polymer; and
> (iii) swelling agent *under conditions wherein there is no substantial polymerization of the monomer*; and
> (b) reducing the level of monomer by at least fifty percent.[58]

On the other hand, claim 1 of the '004 Patent recited:

> 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, … ;
> (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.[59]

Claim 1 of the '435 Patent and claim 1 of the '004 Patent recited the same composition of the multi-stage emulsion polymer.[60] However, the main difference between the two was the use of "under conditions wherein there is no substantial polymerization of the monomer" in the '435 Patent versus the use of "adding an effective amount of one or more polymerization inhibitors or reducing agents to substantially stop any polymerization" in the '004 Patent.[61]

B. Validity issues

On appeal, claims 1–5 of the '435 Patent were alleged to be anticipated by U.S. Patent No. 5,360,827 ("Toda reference") and obvious over U.S. Patent

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[45] *See id.* at col.1 ll.51–53.
[46] *See id.* at col.1 ll.54–56.
[47] *See id.* at col.2 l.57–col.10 l.18.
[48] *See id.* at col.2 l.57–col.7 l.42.
[49] *See id.* at col.7 ll.56–60.
[50] *See id.* at col.7 l.61–col.8 l.20.
[51] *See id.* at col.7 ll.43–55.
[52] *See id.* at col.8 l.39, col.9 ll.10–11.
[53] *Id.* at col.8 ll.40–42.
[54] *Id.* at col.9 ll.11–15.
[55] *See id.* at col.9 ll.20–24.
[56] *See id.* at col.9 ll.22–33.
[57] *See Organik Kimya AS*, 873 F.3d at 890–91, 895.
[58] *Id.* at 890–91 (emphasis added).
[59] *Id.* at 895 (emphasis added).
[60] *See id.* at 890–91, 895.
[61] *See id.* at 890–91, 895.

No. 5,077,320 ("Touda reference").[62] Claims 1–7 of the '004 Patent were alleged to be obvious in view of the Toda reference, Touda reference, and some other patents.[63] The key issue was whether the Toda reference and Touda reference had disclosed "swelling agent" recited in the disputed claims.[64]

The Toda reference and Touda reference were related to hollow emulsion polymers.[65] The Toda reference disclosed Examples 9 and 11 that use potassium hydroxide,[66] while the Touda reference disclosed Examples 1B and 2B that use sodium hydroxide.[67] Potassium hydroxide and sodium hydroxide are bases that are generally defined as "any compound that yields hydroxide ions (OH-) when dissolved in water."[68]

The PTAB construed "swell 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.'"[69] However, the PTAB found that the potassium hydroxide or sodium hydroxide in the prior art does not function as penetrating the shell polymer and then swelling the core polymer.[70] Therefore, the PTAB found that neither the Toda reference nor Touda reference disclosed the use of "swelling agent."[71] Among other things, the PTAB held that the disputed claims were valid.[72]

C. Governing law

Claim construction relies on intrinsic evidence (*e.g.*, claim language, specification, and prosecution history) and extrinsic evidence (*e.g.*, expert testimony, inventor testimony, dictionaries, and treatises).[73] Here, the Federal Circuit relied on the specification and expert testimony to interpret "swelling agent."[74]

In addition, the Federal Circuit reviewed the PTAB's claim construction *de novo*,[75] but with respect to the PTAB's underlying factual findings based on extrinsic evidence, the review standard was substantial evidence.[76] The substantial evidence standard was also applied to the review of the PTAB's determinations on anticipation and underlying facts concerning obviousness.[77]

D. Federal Circuit's reasoning on claim construction

On appeal, Organik challenged the PTAB's claim construction that allegedly improperly read "swelling step" into "swelling agent" and required "swelling agent" to be used under the conditions of the specific process.[78] Organik also asserted that "swelling agent" should be construed as covering any base without being limited to specific reaction conditions suitable for swelling.[79] But the Federal Circuit disagreed.[80]

The Federal Circuit upheld the PTAB's claim construction.[81] First, the Federal Circuit found that the specification not only "describes the swelling agent as a base that permeates the shell and produces swelling by hydration of the hydrophilic core[, but also] describes the factors that affect these chemical process steps, including monomer concentration, base concentration, and temperature."[82]

In addition, the Federal Circuit considered the parties' expert testimony.[83] For instance, the patentee's expert "testified that the 'swelling agent' is

[62] *See id.* at 890.
[63] *See id.* at 895.
[64] *See id.* at 892–95.
[65] *See id.* at 893–94.
[66] *See Organik Kimya AS IPR1*, 2015 WL 3430121, at *8 (emphasis added); *see also Organik Kimya AS IPR2*, 2015 WL 3982308, at *12.
[67] *See Organik Kimya AS IPR1*, 2015 WL 3430121, at *12; *see also Organik Kimya AS IPR2*, 2015 WL 3982308, at *8.
[68] VIRTUAL CHEMBOOK, http://chemistry.elmhurst.edu/vchembook/182bases.html (last visited Mar. 8, 2019).
[69] *Organik Kimya AS IPR1*, 2015 WL 3430121, at *6; *see also Organik Kimya AS IPR2*, 2015 WL 3982308, at *6.
[70] *See Organik Kimya AS IPR1*, 2015 WL 3430121, at *9, *13–*14; *see also Organik Kimya AS IPR2*, 2015 WL 3982308, at *10, *12–*14.
[71] *See Organik Kimya AS IPR1*, 2015 WL 3430121, at *8–*14; *see also Organik Kimya AS IPR2*, 2015 WL 3982308, at *11–*14.
[72] *See Organik Kimya AS IPR1*, 2015 WL 3430121, at *14; *see also Organik Kimya AS IPR2*, 2015 WL 3982308, at *14.
[73] *See* Ping-Hsun Chen, *Claim Construction Cannot Save a Modified Gene Invention Claimed with a Scientifically Debatable Biological Mechanism: A Lesson from Bayer CropScience AG v. Dow AgroSciences LLC, 728 F.3d 1324 (Fed. Cir. 2013)*, 33 BIOTECHNOLOGY L. REP. 209, 212 (2014).
[74] *See Organik Kimya AS*, 873 F.3d at 891–92.
[75] *See id.* at 890.
[76] *See id.*
[77] *See id.*
[78] *See id.* at 891.
[79] *See id.*
[80] *See id.*
[81] *See id.* at 891–92.
[82] *Id.* at 891.
[83] *See id.* at 891–92.

defined in the specification with reference to the process conditions in which it is used."[84] Organik's expert also "testified that the function of the base depends on the conditions of its use."[85] Thus, the Federal Circuit held that "[t]here was no evidence to contravene either the patent specification or the [patentee's] expert testimony."[86]

Organik's alternative challenge to the PTAB's claim construction was based on a sentence in the specification stating that "[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."[87] Organik argued that the use of "include" broadened the scope of "swelling agent" as covering "bases that do not act by penetrating the shell, that are not used under the conditions described in the specification, and that have not been shown to achieve swelling."[88]

The PTAB saw the questioned word "include" being "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."[89] The Federal Circuit agreed.[90]

The Federal Circuit emphasized that "the specification makes clear that the swelling agent is a base capable of permeating the shell and swelling the core under the reaction conditions described in the specification."[91] Thus, the Federal Circuit concluded that "[e]rror has not been shown in the [PTAB's] construction of 'swelling agent' as conforming to the conditions and process in which it is used, as stated in the specification."[92]

E. Federal Circuit's reasoning on validity

On appeal, Organik challenged the PTAB's finding that the Toda reference and Touda reference did not disclose a swelling agent.[93] But, the Federal Circuit disagreed.[94]

The Federal Circuit primarily relied on the statements made by the patentee's expert who reproduced the alleged examples in the Toda reference and Touda reference.[95] For example, the patentee's expert found that Example 9 in the Toda reference showed an experimental condition that makes the shell polymer too hard for potassium hydroxide to permeate.[96] The patentee's expert also described that Example 9 cannot achieve "no substantial polymerization" as required by the patents-in-suit.[97]

In addition, the Federal Circuit found no evidence contradicting the testimony and experimentation made by the patentee's expert.[98] For instance, the Federal Circuit found that the Toda reference did not describe potassium hydroxide as an agent for swelling the core polymer.[99] On the other hand, Organik's expert merely criticized the patentee's expert testimony without conducting any experiment to support the criticism.[100]

Organik also argued that the PTAB should not have required it to conduct experiments to support an assertion that using potassium hydroxide as a swelling agent in Example 9 is inherent because the potassium hydroxide is a base.[101] But, the Federal Circuit disagreed.[102]

The Federal Circuit emphasized that "the issue is not whether experiments by Organik were required, but whether Organik provided sufficient evidence and argument to negate and outweigh the evidence and argument provided by [the patentee]."[103] Therefore, the Federal Circuit upheld the PTAB's decision.[104] Among other things, the Federal Circuit held that the PTAB's validity determination was supported by substantial evidence.[105]

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[84] *Id.* at 891.
[85] *Id.* at 892 (citing a transcript showing that Organik's expert admitted that "the function of sodium hydroxide depend on the conditions of the reaction").
[86] *Id.*
[87] *Id.* (emphasis added).
[88] *Id.*
[89] *Organik Kimya AS IPR1*, 2015 WL 3430121, at *5; *see also Organik Kimya AS*, 873 F.3d at 892.
[90] *See Organik Kimya AS*, 873 F.3d at 892.
[91] *Id.*
[92] *Id.*
[93] *See id.* at 893–96.
[94] *See id.* at 894–96.
[95] *See id.* at 893–96.
[96] *See id.* at 893.
[97] *See id.*
[98] *See id.*
[99] *See id.*
[100] *See id.*
[101] *See Organik Kimya AS*, 873 F.3d at 893–94; *see also Organik Kimya AS IPR1*, 2015 WL 3430121, at *9 ("In other words, Petitioner's argument is that Toda *inherently* discloses that potassium hydroxide is capable of permeating the shell and swelling the core of the polymer particles in Toda's Example 9." (emphasis original)), *10 ("Nor has the Petitioner provided any experimental data or evidence establishing that the process of Toda's Example 9 inherently disclosed a 'swelling agent,' as required by claims 1–5 of the '435 patent.").
[102] *See Organik Kimya AS*, 873 F.3d at 893–94.
[103] *Id.* at 893–94.
[104] *See id.* at 894.
[105] *See id.*

III. PATENT DRAFTING

A. Use of ''swelling agent'' or ''base''

Organik Kimya AS teaches an appropriate way to describe an ingredient used in a polymerization system when such ingredient is a nonobvious element of a claim. The first lesson is that using a functional description (*e.g.*, "swelling agent") for an ingredient (*e.g.*, potassium hydroxide) may help the claimed invention be distinguished from a prior art, even though both technologies use the same ingredient.

The Toda reference was actually listed in the References Cited section of the '435 Patent.[106] Because the Toda reference was not cited by the examiner,[107] it should be included in the patentee's information disclosure statement, suggesting that it was considered by the patentee as a relevant prior art.[108] In addition, the specification of the '435 Patent mentioned the Toda reference as a prior art.[109] Therefore, the patentee had learned Examples 9 or 11 in the Toda reference during the development of the patented technology.[110]

Being aware that potassium hydroxide had been used in Examples 9 or 11 of the Toda reference possibly led to the patent drafter's choice of "swelling agent" as to describe the swelling process in the claims. The specification of the '435 Patent actually listed several bases suitable for the swelling process.[111] One of the listed bases was potassium hydroxide.[112] Had the patent drafter chosen "base" rather than "swelling agent" as a claim term, the '435 Patent and '004 Patent would have been invalidated in light of the disclosure of "potassium hydroxide" in the Toda reference or "sodium hydroxide" in the Touda reference.

In addition, reciting "swelling agent" to describe a base focuses on the function of the base in the patented emulsion polymerization. However, when the patented technology was invented, "swelling agent" might have been a formal, scientific term, but did not always mean a base.[113] As a result, no ordinary and customary meaning could be given to "swelling agent."[114] Here, the Federal Circuit had to look to the specification and expert testimony to construe "swelling agent."[115]

Finally, use of "swelling agent" may limit the term to its definition in the specification.[116] However, the term saves the disputed claims in *Organik Kimya AS* from being invalidated.[117] Therefore, choosing "swelling agent" rather than "base" as a claim term is an appropriate way to recite a swelling process in hollow emulsion polymerization.

B. Mechanism description

The second lesson learned from *Organik Kimya AS* is that the specification must describe a mechanism related to the function of such an ingredient. Process conditions affecting the mechanism must also be highlighted. So, the same ingredient used in the claimed invention and prior art can be distinguishable because of different mechanisms involved.

The PTAB's construction of "swelling agent" upheld by the Federal Circuit in *Organik Kimya AS* includes a functional phrase "*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."[118] The functional phrase represents a mechanism achieved by a swelling agent.[119]

The patentee's expert relied on the functional phrase to distinguish the patented technology from the Toda reference or Touda reference.[120] For example, the patentee's expert conducted experiments according to Example 9 in the Toda reference and found that the reaction condition described in Example 9 turns the shell polymer into a hard shell that prevents potassium hydroxide from permeating the shell polymer.[121]

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[106] *See* U.S Patent No. 6,020,435 front page.
[107] *See* U.S Patent No. 6,020,435 front page.
[108] *See Fenton Golf Tr. v. Cobra Golf Inc.*, No. 97 C 247, 1999 WL 959432, at *3 (N.D. Ill. July 29, 1999) ("In pursuit of the '109 patent, Francis Fenton submitted an Information Disclosure Statement (IDS) for the purpose of disclosing prior art pertinent to the '109 application.").
[109] *See* U.S Patent No. 6,020,435 col.1 ll.39–42.
[110] *See id.* at col.1 ll.39–42.
[111] *See id.* at col.8 ll.45–52.
[112] *See id.* at col.8 l.49.
[113] *See* U.S Patent No. 6,020,435 front page (showing the filing date of November 20, 1997); *see generally* A. Tuncel and E. Pişkin, *Swollen Emulsion Polymerization of Styrene with Cetyl and/or Lauryl Alcohol as Swelling Agent*, 31 Polymer-Plastics Tech. & Engineering 807 (1992) (using lauryl alcohol as a swelling agent).
[114] *See supra* Part II.C; *see also Enzo Biochem Inc. v. Applera Corp.*, 780 F.3d 1149, 1153–54 (Fed. Cir. 2015) ("[T]he words of a claim are generally given their ordinary and customary meaning [that] a person of ordinary skill in the art in question, at the time of the invention, would have understood the claim to mean." (internal quotation marks and citations omitted)).
[115] *See supra* Part II.C; *see also Enzo Biochem Inc.*, 780 F.3d at 1154.
[116] *See supra* Part II.C.
[117] *See supra* Part II.D.
[118] *Organik Kimya AS*, 873 F.3d at 891 (emphasis added).
[119] *See* U.S Patent No. 6,020,435 col.8 ll.40–44.
[120] *See id.* at 893–96.
[121] *See id.* at 893 (citing *Organik Kimya AS IPR1*, 2015 WL 3430121, at *9).

In addition, the functional phrase is not only stated in the specification of the '435 Patent, but also affiliated with a mechanism described in the specification. As the Federal Circuit observed, "[t]he specification describes the swelling agent as a base that permeates the shell and produces swelling by hydration of the hydrophilic core[.]"[122] The specific mechanism the Federal Circuit quoted is:

> 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.[123]

Moreover, the functional phrase is more than a mechanism, and it includes process conditions. As the Federal Circuit found, "[t]he specification [of the '435 Patent] describes the factors that affect these chemical process steps, including monomer concentration, base concentration, and temperature."[124] For example, regarding "monomer concentration," the specification requires that "[t]he monomers used and the relative proportions thereof in the shell should be such that it is permeable to an aqueous or gaseous volatile or fixed basic swelling agent capable of swelling the core."[125] Regarding "base concentration," the specification teaches that the amount of swelling agent depends on "the equivalents of the functionality in the core capable of being neutralized."[126] Regarding "temperature," the specification discloses that when a swelling agent is added to the emulsion polymerization system, the temperature therefore has been elevated above the shell polymerization temperature.[127]

Relying on the process conditions, the patentee's expert could testify that a swelling agent "is defined in the specification with reference to the process conditions in which it is used"[128] and that the reaction temperature in Example 9 of the Toda reference causes potassium hydroxide not to function as a swelling agent as required in the '435 Patent.[129] Therefore, the process conditions for a swelling agent helps distinguish potassium hydroxide used in the '435 Patent from that used in the Toda reference.

IV. CONCLUSION

The patents-in-suit in *Organik Kimya AS* were found valid. Based on the specification and expert testimony, a key claim term, "swelling agent," was construed as being distinguished from the prior art. For example, the specification described the swelling agent as being capable of permeating the shell to swell the core. The specification also provided the reaction conditions for achieving the swelling step. As a result, although the swelling agent was described as a base in the specification, it was not considered as the same base used in the prior art.

Therefore, *Organik Kimya AS* teaches an appropriate way to describe an ingredient in a claim that recites emulsion polymerization. First, a claim may recite a functional description (*e.g.*, "swelling agent") of an ingredient (*e.g.*, potassium hydroxide). Second, the specification must disclose a mechanism (*e.g.*, swelling) related to the function of the ingredient and process conditions facilitating such function. With these two aspects, the ingredient can be a novel or nonobvious feature in light of prior arts that use the same ingredient.

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[122] *Id.* at 891.
[123] *Id.* (quoting U.S Patent No. 6,020,435 col.9 ll.10–15).
[124] *Id.* (citing U.S Patent No. 6,020,435 col.4 ll.48–55, col.8 ll.60–66, col.8 l.66–col.9 l.6).
[125] U.S Patent No. 6,020,435 col.4 ll.48–51.
[126] *Id.* at col.8 ll.62–66.
[127] *See id.* at col.8 l.66–col.9 l.3.
[128] *Organik Kimya AS*, 873 F.3d at 891 (citing *Organik Kimya AS IPR1*, 2015 WL 3430121, at *5).
[129] *See id.* at 891–92 (citing *Organik Kimya AS IPR1*, 2015 WL 3430121, at *9).