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Paper 10
Date: April 22, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SNF S.A.,
Petitioner,

v.

SOLENIS TECHNOLOGIES, L.P.,
Patent Owner.

IPR2020-01730
Patent 9,644,320 B2

Before CHRISTOPHER L. CRUMBLEY, JEFFREY W. ABRAHAM, and DAVID COTTA, *Administrative Patent Judges*.

COTTA, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. Introduction

SNF S.A. ("Petitioner) filed a Petition requesting *inter partes* review of claims 1–21 of U.S. Patent No. 9,644,320 B2 (Ex. 1001, "the '320 patent").[1] Paper 2 ("Petition" or "Pet."). Solenis Technologies, L.P. ("Patent Owner") filed a Preliminary Response to the Petition. Paper 7 ("Prelim Resp.").[2] With our authorization, Petitioner filed a Reply specifically addressing Patent Owner's argument that the Petition should be denied pursuant to 35 U.S.C. § 325(d) (Paper 8, "Reply"), and Patent Owner filed a Sur-Reply in response (Paper 9, "Sur-Reply").

Institution of *inter partes* review is authorized by statute only when "the information presented in the petition ... shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314; *see* 37 C.F.R. § 42.108(c). For the reasons discussed below, upon consideration of the Petition, the Preliminary Response, and the supporting evidence, we deny institution of *inter partes* review.

A. Related Proceedings

The parties represent that "[t]here are no related litigations." Pet. 3; Paper 5, 1.

B. The '320 Patent

The '320 patent issued May 9, 2017, identifying Matthew D. Wright as the inventor. Ex. 1001, code (72). The '320 patent relates to "cellulose reactive high molecular weight, high cationic charge glyoxalated copolymers

[1] Petitioner identifies SNF S.A. and SPCM S.A. as the real parties in interest. Paper 4.
[2] Patent Owner identifies Solenis Technologies, L.P. as the only real part in interest. Paper 5.

made from acrylamide monomer and diallyldimethylammonium halide monomer." *Id.* at 1:9–14.

The '320 patent teaches that "[g]lyoxalated polyacrylamide (G-PAM) can be used in a variety of paper grades to provide paper with dry and temporary wet strength." *Id.* at 1:24–26. According to the '320 patent, glyoxalated polyacrylamide has been prepared by reacting glyoxal with a cationic polyacrylamide copolymer comprising acrylamide and diallyldimethylammonium chloride ("DADMAC") monomers. *Id.* at 1:32–55. The '320 patent teaches that "[c]onventional G-PAMs have molecular weights of 100,000 Daltons or less to avoid gelation during the glyoxalation process." *Id.* at 56–58. The '320 patent further teaches that:

> increasing the ratio of DADMAC to acrylamide is expected to reduce strength efficiency, because the dry strength efficiency of G-PAMs is generally believed to derive from covalent bonds which form between the pendant aldehyde groups associated with glyoxal bound to amide groups from the acrylamide portion of the polymer. Due to this tradeoff, G-PAMs are conventionally made from acrylamide/DADMAC copolymers with a molecular weight in the range of 5,000 to 15,000 Daltons, and a weight ratio of acrylamide/DADMAC with a weight of acrylamide/ DADMAC of 90–95 wt. % acrylamide to 10–5 wt. % DADMAC.

Id. at 1:61–2:5. Additionally, the '320 patent teaches that:

> It has been surprisingly discovered that, provided the weight average molecular weight of the cationic copolymer prior to glyoxalation is a weight average molecular weight of about 120,000 Daltons to 1 million Dalton and the percentage of diallyldimethylammonium halide monomer in the cationic copolymer before glyoxalation is about 15 to about 85 weight % diallyldimethylammonium, then the glyoxalated copolymer compositions formed from the cationic copolymer can both improve water drainage during paper processing and strengthen

> the paper or boards treated using the glyoxalated copolymer compositions.

Id. at 8:46–56.

C. Illustrative Claims

Petitioner challenges claims 1–21 of the ’320 patent. Claim 1 is representative and is reproduced below with bracketing added for clarity.

> 1. A cellulose reactive glyoxalated copolymer composition comprising:
>
> [a] an aqueous medium containing about 0.25 to about 4 weight %, of a glyoxalated copolymer, based on total weight of the aqueous medium,
>
> [b] wherein the glyoxalated copolymer is obtained by reaction in an aqueous reaction medium of a dry weight ratio of glyoxal:cationic copolymer ranging from about 5 to about 40 glyoxal to about 95 to about 60 cationic copolymer;
>
> [c] wherein the cationic copolymer has a weight average molecular weight of about 120,000 to about 1 million Daltons based on total weight of the cationic copolymer before glyoxalation;
>
> [d] wherein the cationic copolymer comprises about 15 to about 85 weight % diallyldimethylammonium halide monomer and
>
> [e] about 85 to about 15 weight % acrylamide monomer, based on total weight of the cationic copolymer before glyoxalation; and
>
> [f] wherein a ratio of the weight average molecular weight of the cationic copolymer before glyoxalation to weight % of diallyldimethylammonium halide monomer making up the cationic copolymer before glyoxalation is greater than or equal to 4000 Daltons/weight %.

Ex. 1001, 20:45–21:2.

D. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–21 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–21	103	Wright,[3] Coscia,[4] Lu,[5] Dauplaise,[6] Cyr[7]
1–21	103	Lu, Wright, Coscia, Cyr
1–21	103	Dauplaise, Lu, Coscia, Cyr, Viscosity Conversion Table[8]

Petitioner submits the Declaration of Dr. Stephan Kleemann (Ex. 1003) in support of institution of *inter partes* review.

E. Person of Ordinary Skill in the Art

Factual indicators of the level of ordinary skill in the art include "the various prior art approaches employed, the types of problems encountered in the art, the rapidity with which innovations are made, the sophistication of the technology involved, and the educational background of those actively working in the field." *Jacobson Bros., Inc. v. U.S.*, 512 F.2d 1065, 1071 (Ct. Cl. 1975); *see also Orthopedic Equip. Co., v. U.S.*, 702 F.2d 1005, 1011 (Fed. Cir. 1983) (quoting with approval *Jacobson Bros.*).

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[3] Wright, U.S. Patent No. 8,222,343 B2, issued July 17, 2012 (Ex. 1005) ("Wright")
[4] Coscia et al., U.S. Patent No. 3,556,932, issued Jan. 19, 1971 (Ex. 1004) ("Coscia")
[5] Lu et al., U.S. Patent No. 8,435,382 B2, issued May 7, 2013 (Ex. 1006) ("Lu")
[6] Dauplaise et al., U.S. Patent No. 5,723,022, issued Mar. 3, 1998 (Ex. 1007) ("Dauplaise")
[7] Cyr et al., U.S. Patent No. 7,828,934 B2, issued Nov. 9, 2010 (Ex. 1008) ("Cyr")
[8] Dianal America Inc., *Viscosity Conversion Table*.

Petitioner contends that the person of ordinary skill in the art ("POSA") would be:

> a person with either: (1) a Ph.D. in the field of paper technology, chemistry, polymer chemistry, chemical engineering, materials sciences and/or a related field and having at least one year of educational or work experience in the synthesis and development of cationic copolymer materials for use in the papermaking industry; (2) a bachelor's degree in the field of paper technology, chemistry, polymer chemistry, chemical engineering, materials sciences and/or a related field and having at least two years of educational or work experience in the synthesis and development of cationic copolymer materials for use in the papermaking industry; or (3) any scientific or engineering education and experience equivalent to (1) or (2).

Pet. 18–19 (citing Ex. 1003 ¶ 41). At this stage in the proceeding, Patent Owner does not challenge Petitioner's identification of the qualifications for a POSA. *See generally* Prelim. Resp. Accordingly, for purposes of this Decision and based on the present record, we accept Petitioner's definition, as it is consistent with the level of skill reflected in the asserted prior art references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

F. Claim Construction

We construe claims "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b)." 37 C.F.R. § 42.100. Therefore, we construe the challenged claims under the framework set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–19 (Fed. Cir. 2005) (en banc). Under this framework, claim terms are given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention, in light of the language of the claims, the specification, and the prosecution history of record. *Id.* Only those terms that are in controversy need be construed, and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

At this stage of the proceeding, we determine that no explicit construction of any claim term is necessary to determine whether to institute a trial in this case. *Id.* at 1017 ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("[C]laim terms need only be construed 'to the extent necessary to resolve the controversy'").

II. Obviousness

Petitioner asserts that the subject matter of claims 1–21 of the '320 patent would have been obvious over various combinations of the cited art. Pet. 31–62. Patent Owner opposes. Prelim. Resp. 34–49.

We begin our analysis by briefly summarizing the disclosures of the cited art. We then consider whether Petitioner has carried its burden to establish that at least one of the challenged claims are unpatentable as having been obvious over the cited art. Because Petitioner's evidence and arguments with respect to the issues we find dispositive are substantially the same for all three grounds, we analyze all three grounds together. Having reviewed Petitioner's arguments, Patent Owner's Response, and the evidence of record, we conclude that Petitioner has not carried its burden to establish that it is reasonably likely to prevail in showing that at least one of the challenged claims would have been obvious over the cited art.

A. Disclosures of the Asserted Prior Art

1. Wright (Ex. 1005)

Wright discloses a method for preparing a cellulose reactive adduct of polyvinylamide, e.g., a glyoxal-reacted water-soluble vinylamide polymer. Ex. 1005, 1:12–14, 23–32, 2:46–51. "The polyvinylamide cellulose reactive adduct obtained by the process of the invention is used as [a] dry and wet strength aid for paper." *Id.* at 1:15–19.

Wright discloses glyoxalating a vinylamide copolymer. *Id.* at 4:31–44. The vinylamide copolymer may be formed from an acrylamide monomer and a cationic monomer, which may be DADMAC. *Id.* at 6:41–42, 7:14–16. Wright discloses that the amount of cationic monomer in the copolymer may range from as low as 0 or 0.1 wt. % up to about 90 wt. %, including about 30 wt. % and about 25 wt. %, "based on the total weight of monomer(s) charged to form the vinylamide polymer." *Id.* at 7:29–34.

Wright discloses that the polyvinylamide copolymer is reacted with glyoxal "wherein the vinylamide polymer has an average molecular weight of at least about 30,000 to at least about 500,000 or even as high a molecular weight as 5,000,000. For example, the molecular weight may be at least about . . . 100,000 or higher." *Id.* at 3:30–37; *see also id.* at 6:34–36 ("Preferable average molecular weight ranges are for example between . . . 25,000 to about 150,000.").

2. Coscia (Ex. 1004)

Coscia discloses hydrophilic thermosetting vinylamide polymers that are used to impart treated paper with excellent dry and wet strength. Ex. 1004, 1:34–40, 1:51–2:6. Specifically, Coscia discloses "cationic water-soluble reaction products of glyoxal with polymers composed of acrylamide and diallyldimethyl ammonium chloride residues in molar ratio between 99:1 and 75:25." *Id.* at 3:52–56. The polymers are "are prepared from vinylamides which may have any molecular weight up to the point where they do not dissolve in water but instead merely form non-fluid gels. Such polymers are adequately water-soluble at molecular weights in the range of 100,000–1,000,000." *Id.* at 3:61–67. The polymers are used to form aqueous solutions containing 2–5 % solids. *Id.* at 4:3–14, 9:1–5.

In a specific example, Coscia discloses forming a mixture of 70 g powered copolymer of acrylamide:DADMAC in a 90:10 molar ratio with 18 g of powder glyoxal hydrate. *Id.* at 14:56–75. To form a solution, Coscia discloses combining 2.2 g of the mixture with 10 g of water, causing the glyoxal to react with the copolymer. *Id.* at 15:3–10.

3. Lu (Ex. 1006)

Lu discloses glyoxalated polyacrylamide compositions that can be used as additives for papermaking, providing paper with good dry and temporary wet strength, and increasing papermaking de-watering rates. Ex. 1006, code (57). Specifically, Lu discloses that the "higher charged glyoxalated acrylamide polymer according to the present teachings" provides dry and wet strength performance comparable to commercial 7.5% concentration glyoxalated acrylamide products and "[s]ignificantly improved de-watering for papermaking processes." *Id.* at 10:1–6.

Lu discloses that the glyoxalated polyacrylamide polymer comprises from about 75% to about 10% by weight acrylamide monomer and from about 25% to about 90% by weight cationic monomer copolymerizable with the acrylamide monomer. *Id.* at 3:27–43. The cationic monomer may include DADMAC. *Id.* at 3:53–54.

Lu discloses that "the glyoxalated polyacrylamide polymer can be the reaction product of glyoxal and a base polymer comprising the acrylamide monomer and the cationic monomer in a weight ratio, ranging, for example, from about 0.10 to about 0.6:1." *Id.* at 3:60–64. Moreover, "[t]he base polymer can have a molecular weight ranging, for example, from about 500 Daltons to 100,000 Daltons." *Id.* at 3:65–67.

4. Dauplaise (Ex. 1007)

Dauplaise discloses employing blends of glyoxylated vinylamide polymers as wet strength improving agents during paper manufacturing. Ex. 1007, 2:3–14. Examples of suitable glyoxylated vinylamide polymers include "[p]roducts of glyoxal with polymers composed of acrylamide and diallyldimethyl ammonium chloride resides [sic, residues] in molar ratio between 99:1 and 75:25." *Id.* at 4:5–7. "The polymers are prepared from vinylamides which may have any weight average molecular weight up to the point where they do not dissolve in water but instead merely form non-fluid gels. Such polymers are adequately water-soluble at molecular weights in the range of 100,000–2,000,000 via light scattering." *Id.* at 4:13–18. Dauplaise discloses that the polymers are not overly viscous in aqueous solutions and "these polymers may usefully possess still high molecular weights." *Id.* at 4:18–20. Dauplaise teaches that "lower molecular weight polymers are more easily handled (because of their lower viscosity and easier water-dilutability) and when reacted with glyoxal they possess increased storage stability." *Id.* at 4:20–23. According to Dauplaise, "[i]t is preferred to employ polymers having molecular weights ranging from about 5,000 to about 25,000 as starting materials." *Id.* at 4:23–26.

5. Cyr (Ex. 1008)

Cyr discloses "glyoxalated copolymers of acrylamide containing significant amounts of cationic comonomer." Ex. 1008, 1:12–14. "These resins, when added as a wet-end paper chemicals, provide wet and dry strength in paper making systems which contain sulfite ion. Also, the resins were found to provide drainage benefits in recycled linerboard." *Id.* at 1:14–18.

Cyr discloses a reactive cationic resin comprising a dialdehyde combined with a copolymer produced from a dialdehyde reactive comonomer and a cationic comonomer, e.g., DADMAC. *Id.* at 2:34–38. The cationic comonomer is preferably present in an amount "greater than about 25 mole % of the dialdehyde-reactive copolymer before reaction with dialdehyde," up to 90 mole %. *Id.* at 5:31–43. Preferred dialdehydes include glyoxal. *Id.* at 5:45–50.

Cyr discloses examples showing that "glyoxalated copolymers containing 20 mole % cationic comonomer, provided significant benefits for dry strength" and "much more wet strength under the papermaking conditions applied." *Id.* at 15:14–20.

B. Analysis

The parties focus their discussion on claim 1 and we do as well. Claim 1 requires, among other things, that the ratio of the weight average molecular weight ("WAMW") of the claimed cationic copolymer to the percentage of the copolymer comprised of DADMAC ("% DADMAC") is "greater than or equal to 4000 Daltons/weight %" (the "ratio limitation" or the "claimed ratio"). Our discussion centers on whether Petitioner has carried its burden to demonstrate a reasonable likelihood that it will prevail in showing that the prior art taught or suggested this limitation. Because Petitioner's evidence and argument with respect to the ratio limitation for all three grounds is sufficiently similar, we analyze all three grounds together. For the reasons discussed below, we find that Petitioner has not satisfied its burden with respect to the ratio limitation for any of the three proposed grounds.[9]

Petitioner acknowledges that none of the cited references expressly discloses a ratio between WAMW and % DADMAC. Pet. 3. To arrive at the ratio limitation, Petitioner relies on the disclosure in the prior art of ranges for the components that comprise the claimed ratio – i.e., ranges for WAMW and for % DADMAC.[10] Petitioner uses the WAMW and % DADMAC ranges in two ways. First, Petitioner selects values falling within the disclosed ranges and uses those values to calculate a ratio of WAMW to % DADMAC. *Id.* at 36 (selecting values in connection with Ground 1), 47 (selecting values in connection with Ground 2),[11] 55

[9] We recognize that claims 12 and 13 do not include limitations requiring any particular ratio of WAMW to % DADMAC. However, each of these claims requires that the claimed copolymer have a WAMW of "about 120,000 to about 1 million Daltons." For the reasons discussed *infra* p. 21–22, Petitioner fails to present an adequate evidentiary foundation supporting Petitioner's argument that optimizing WAMW would result in a polymer meeting this limitation. Accordingly, we are not persuaded that Petitioner is likely to prevail in showing that these claims would have been unpatentable as obvious over the cited art.

[10] In Ground 1, Petitioner relies on Wright's disclosure of ranges of WAMW and % DADMAC. Pet. 36. In Ground 2, Petitioner relies on Lu's disclosure of ranges of WAMW and % DADMAC. *Id.* at 47. In Ground 3, Petitioner relies on Dauplaise's disclosure of ranges of WAMW and % DADMAC. *Id.* at 55.

[11] Notably, the WAMW value Petitioner selects to calculate the ratio in connection with Ground 2 is only 100,000 Daltons, which, depending on

(selecting values in connection with Ground 3). Second, Petitioner argues that it would have been obvious to optimize WAMW and % DADMAC within the disclosed ranges and that doing so would lead to the claimed ratio. *Id.* at 41–44 (reasoning for Ground 1), 51–52 (reasoning for Ground 2), 58–60 (reasoning for Ground 3). We are not persuaded that either use of the WAMW and % DADMAC ranges disclosed in the art is sufficient to support that the claimed ratio would have been obvious.

1. Petitioner's Use of Specific Values to Calculate a Ratio

Petitioner attempts to show that the claimed ratio is obvious by selecting specific WAMW and % DADMAC values and using those values to calculate a ratio of WAMW to % DADMAC. For example, in connection with Ground 1, Petitioner asserts:

> Regarding [the ratio limitation], the ratio of 150,000 WAMW to 25 wt.% DADMAC, as both taught by Wright '343, is 6,000. Similarly, the ratio of 1,000,000 WAMW to 30 wt.% DADMAC is 33,333.

Pet. 36. Petitioner, however, never explains how or why a person of ordinary skill in the art would have been led to select the value "150,000 WAMW," or "25 wt.% DADMAC," or any of the specific values it uses to calculate the claimed ratio. Nor does Petitioner direct us to any disclosure in the prior art showing an embodiment having the specific values used in Petitioner's calculations. Petitioner's calculation of ratios for Grounds 2 and 3 are similarly deficient. *Id.* at 47 (Ground 2), 55 (Ground 3).

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how broadly one interprets the claim term "about 120,000," arguably does not meet the claim limitation requiring that the cationic copolymer has a WAMW of "about 120,000 to about 1 million Daltons." Petitioner does not address this issue.

In connection with Ground 1, Petitioner cites the testimony of Dr. Kleemann as supporting its selection of specific values in the above quoted passage. *Id.* at 36 (citing Ex. 1003 ¶ 69). But Dr. Kleemann's testimony does nothing to illuminate why any particular value was selected. The cited testimony, in its entirety, reads:

> In my opinion, it would have been obvious for a skilled person reading Wright '343 to routinely select a molecular weight of 150,000 and a DADMAC concentration of 25 wt.%, which yields a ratio of 6,000 as claimed in Wright '320. Similarly, it also would have been obvious to routinely select a molecular weight of 1,000,000 and 30 wt.% DADMAC, as both taught by Wright '343, resulting in a ratio of 33,333.

Ex. 1003 ¶ 69. Dr. Kleemann testifies that it would have been "obvious" and "routine" to select molecular weights of 150,000 and 1,000,000 and to select DADMAC concentrations of 25% and 30%, but Dr. Kleemann never explains how or why the particular combinations of values used to calculate the ratio were selected. *Id.* Such conclusory assertions are insufficient to support a conclusion of obviousness. *In re Stepan Co.,* 868 F.3d 1342, 1346 (Fed. Cir. 2017) (explaining that there must be "some rational underpinning explaining why a person of ordinary skill in the art would have arrived at the claimed invention through routine optimization"); *see also KSR*, 550 U.S. at 418 (explaining that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness"). Dr. Kleemann's testimony in connection with Grounds 2 and 3 is similarly deficient. *Id.* ¶ 104 (Kleemann testimony regarding Ground 2 (cited at Pet. 47)), ¶ 133 (Kleemann testimony regarding Ground 3 (cited at Pet. 55)).

Absent explanation from Petitioner, it appears that Petitioner picked the specific values it used to calculate a ratio from broad, unrelated ranges of WAMW and % DADMAC disclosed in the prior art simply because they combine to produce a ratio that meets the ratio recited in the claims of the ’320 patent. This suggests Petitioner relied on hindsight in forming its challenges. *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017) (“[W]e cannot allow hindsight bias to be the thread that stitches together prior art patches into something that is the claimed invention.”).

This use of hindsight is not excused by the mere fact that the specific values combined to produce the claimed ratio fall within the ranges disclosed in the prior art. *See In re Stepan Co.,* 868 F.3d at 1347 (reversing Board finding that claim drawn to three ranges of surfactants that in combination with water and a glyphosate salt produce a concentrate having a cloud point of 70º C was obvious where “[t]he Board failed to explain why it would have been ‘routine optimization’ to select and adjust the claimed surfactants and achieve a cloud point of at least 70ºC” notwithstanding teaching in the art that “the surfactant component comprises any combination of surfactants” and that “the ideal cloud point should be above 60º[C]”); *In re Antonie,* 559 F.2d 618, 619-20 (C.C.P.A. 1977) (holding that claims drawn to a wastewater treatment device having a specific ratio of tank volume to contractor area were not obvious in view of a prior art wastewater treatment device even though the claimed ratio could have been obtained by increasing the contractor area of the prior art device, which the cited art taught increases “efficiency,” while maintaining the tank volume at the level disclosed in the cited art); *Cf Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, (Fed. Cir. 2006) (“[T]he disclosure of a range of 150 to 350

°C does not constitute a specific disclosure of the endpoints of that range, i.e., 150 °C and 350 °C. . . . The disclosure is only that of a range, not a specific temperature in that range, and the disclosure of a range is no more a disclosure of the end points of the range than it is of each of the intermediate points.”).

Accordingly, we are not persuaded that Petitioner’s calculation of ratios using specific WAMW and % DADMAC values selected from ranges disclosed in the art supports that the ratio limitation would have been obvious over the cited art.

2. Petitioner’s Reliance on Optimization as Supporting the Obviousness of the Claimed Ratio

Petitioner argues that the claimed ratio would have been obvious because “a POSA would have arrived at the ratio using routine experimentation to optimize result-effective variables, as guided by the art.” Pet. 41–42 (Ground 1), 51 (repeating same argument for Ground 2), 58 (arguing, in connection with Ground 3, that “a POSA may need to select certain values . . . to arrive at the claimed ratio . . . [and] any such selection would involve only ordinary skill and routine optimization”). There is some ambiguity in the Petition as to precisely how “routine experimentation to optimize result-effective variables” would lead to the claimed ratio. *See generally,* Pet. 41–44 (Ground 1), 51–52 (Ground 2), 58–60 (Ground 3). We see two possibilities. First, Petitioner may be arguing that a POSA would have optimized the ratio itself. Second, Petitioner may be arguing that independently optimizing WAMW and independently optimizing % DADMAC would result in values that produce the claimed ratio. We find that Petitioner has not carried its burden to establish that it is likely to prevail with respect to either of these two possibilities.

a) Optimizing to Achieve the Claimed Ratio

The record does not support that a POSA would have arrived at the claimed ratio using routine experimentation to optimize the ratio of WAMW to % DADMAC because, as Patent Owner explains, "there is no evidence that skilled artisans knew that the claimed ratio of WAMW to % DADMAC was a parameter of any importance or one worth optimizing." Prelim. Resp. 36. Petitioner does not direct us to any teaching in the art recognizing the claimed ratio as having any import. Indeed, Petitioner concedes that the prior art does not recognize the ratio of WAMW to % DADMAC as a result-effective variable. Pet. 3 ("The fact that the prior art does not expressly recognize the relationship between result-effective variables WAMW and %DADMAC is of no moment."). Absent evidence that the claimed ratio was recognized to be a result effective variable, the record does not support that it would have been obvious to optimize the ratio. *In re Antonie,* 559 F.2d at 620 (finding exception to the "rule that the discovery of an optimum value of a variable in a known process is normally obvious" where "the parameter optimized was not recognized to be a result-effective variable").

b) Achieving the Claimed Ratio by Independently Optimizing WAMW and % DADMAC

The record also does not support that a POSA would have arrived at the claimed ratio by independently optimizing WAMW and % DADMAC within the ranges disclosed in the prior art. As a simple matter of mathematics, the prior art ranges of WAMW and % DADMAC cited in the Petition encompass innumerable combinations of values that produce copolymers with ratios outside the scope of the claims. Petitioner has not directed us to persuasive evidence supporting a conclusion that independently optimizing WAMW and % DADMAC would result in a polymer having the claimed ratio rather than one of the many ratios falling outside the scope of the claims. Indeed, according to Petitioner, polymers outside the scope of the claim exhibit the same properties as those having the claimed ratio. Pet. 43 ("[C]omparative polymers outside the scope of the claim reduced drainage time and improved dry-strength relative to a blank, just like the claimed copolymers."); Ex. 1003 ¶ 32 (Dr. Kleemann's testimony that copolymers having WAMW to % DADMAC ratios outside the scope of the claims nonetheless exhibit improved water drainage and paper strength). This suggests that independently optimizing WAMW or % DADMAC for drainage time and/or paper strength may well lead to a copolymer having a different ratio than that set forth in the claim.

In addition, the Petition presupposes that a POSA would optimize WAMW by simply increasing it. Pet. 7 (asserting, without qualification, that "increasing the WAMW increases the binding to cellulose which increases the wet-strength and dry-strength of paper.").[12] But the evidence Petitioner cites to show that WAMW was known to be a result-effective variable is more nuanced than the Petition suggests. In particular, the cited evidence includes Dr. Kleemann's testimony that "***[i]n a certain range*** of molecular weight of cationic polyacrylamide, it is known to increase the binding of cellulose which increases wet strength and especially dry strength." Ex. 1003 ¶ 17 (emphasis added).[13] Dr. Kleemann's testimony is

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[12] This is the only instance in the Petition where Petitioner cites evidentiary support for its assertion that WAMW is a result-effective variable.

[13] In addition to Dr. Kleemann's testimony, Petitioner also cites Exhibits 1034 and 1035, without including pinpoint cites. Petitioner's failure to provide pin cites for these Exhibits makes it difficult for us to discern how Petitioner contends these Exhibits support its position. *DeSilva v. DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999) ("A brief must make all

consistent with Lu, which teaches that "[p]aper strength tends to deteriorate where the base polymer weight is either too high or too low." Ex. 1006, 4:4–5.

Neither Petitioner nor Dr. Kleemann persuasively identifies a range within which increasing WAMW was known increase paper strength or discusses how the existence of such a range impacts the likelihood of obtaining a copolymer meeting the ratio limitation by independently optimizing WAMW. This omission undermines the evidentiary support for the proposition that independently optimizing WAMW would result in a polymer that meets the ratio limitation, particularly when we consider the evidence supporting the use of a polymer with a relatively low WAMW.[14] *See* Ex. 1006, 3:65–4:8 (disclosing a base polymer with a WAMW ranging from 500–100,000 Daltons, while teaching that strength "tends to deteriorate" when WAMW is "too high" and that a range of "about 3,000 to about 13,000 Daltons" is preferred); Ex. 1001, 1:56–2:5 (teaching that "[c]onventional G-PAMs have molecular weights of 100,000 Daltons or less to avoid gelation during the glyoxalation process" and that G-PAMs are conventionally made with a WAMW of 5,000 to 15,000 Daltons); *see also,*

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arguments accessible to the judges, rather than ask them to play archaeologist with the record."). The failure to provide pin cites also violates 35 U.S.C. § 322, which requires that a petition identify "in writing, and with particularity, . . . the evidence that supports the grounds for the challenge to each claim." Nevertheless, we have reviewed these exhibits and do not find information in them to adequately support the statement for which they were cited – that WAMW was known to be a result-effective variable and that increasing WAMW increases paper strength.

[14] It also undermines the evidentiary support for the proposition that optimizing WAMW would result in a polymer meeting the limitation requiring a WAMW of "about 120,000 to about 1,000,000 Daltons."

Ex. 1004, 1:65–75 (disclosing polymers with WAMWs ranging from 100,000 to 1,000,000 but teaching that "it is preferred to employ polymers having molecular weights less than 25,000 as starting materials"); Ex. 1007, 4:15–25 (disclosing polymers with WAMWs ranging from 100,000 to 2,000,000 but teaching that "it is preferred to employ polymers having molecular weights less than 25,000 as starting materials").

In sum, the evidence of record does not support adequately Petitioner's assertion that independently optimizing WAMW and % DADMAC would result in a polymer having the claimed ratio.

III. Conclusion

For the foregoing reasons, we do not institute trial as to the challenge over the combination of Wright in view of Coscia, Lu, Dauplaise, or Cyr (Ground 1), over the combination of Lu alone or in view of Wright, Coscia or Cyr (Ground 2), and over the combination of Dauplaise alone or in view of Lu, Coscia, or Cyr, as evidenced by the Viscosity Conversion Table (Ground 3).

IV. Order

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is denied, and that we do not institute *inter partes* review of any claim of the '320 patent based on the grounds asserted in this Petition.

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