

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THERMO FISHER SCIENTIFIC, INC.,
Petitioner,

v.

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA,
Patent Owner.

Case IPR2018-01370
Patent 8,110,673 B2

Before ERICA A. FRANKLIN, MICHELLE N. ANKENBRAND, and
JOHN E. SCHNEIDER, *Administrative Patent Judges*.

ANKENBRAND, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314(a)

I. INTRODUCTION

Thermo Fisher Scientific, Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–3, 6–12, 14–17, and 19 of U.S. Patent No. 8,110,673 B2 (Ex. 1001, “the ’673 patent”). Paper 1 (“Pet.”). The Regents of the University of California (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 8 (“Prelim. Resp.”).

We have authority under 35 U.S.C. § 314 to determine whether to institute an *inter partes* review. Upon considering the Petition and the Preliminary Response, along with the circumstances involved in this case, we determine that Petitioner does not show a reasonable likelihood that it would prevail in showing the unpatentability of at least one challenged claim. Accordingly, we deny the Petition and decline to institute an *inter partes* review.

II. BACKGROUND

A. Related Matters

Petitioner and Patent Owner identify an ongoing district court proceeding involving the ’673 patent: *The Regents of the University of California et al. v. Affymetrix, Inc. et al.*, No. 3:17-cv-01394 (CASD). Pet. 69; Paper 4, 2. The parties also note that Petitioner concurrently filed a separate petition involving the ’673 patent (IPR2018-01370) and, shortly before, filed two petitions involving a related patent, U.S. Patent No. 8,835,113 B2 (IPR2018-01367 and IPR2018-01368). Pet. 69–70; Paper 4, 1–2.

B. The ’673 Patent

The ’673 patent, titled “Aggregation Sensor and Solutions and Kits Comprising the Same,” issued on February 7, 2012. Ex. 1001, [45], [54].

The '673 patent relates to an aggregation sensor for detecting and analyzing aggregants in a sample. *Id.* at 1:26–27. According to the specification, “[t]here is a continuing need in the art for methods of detecting and analyzing particular biomolecules [i.e., aggregants] in a sample, and for compositions and articles of manufacture useful in such methods.” *Id.* at 1:56–59. An aggregant or biomolecule to be assayed may include, for example, a polysaccharide, a polynucleotide, a peptide, or a protein. *Id.* at 15:56–58. “The aggregation sensor comprises a component that can bind to an aggregant or class of aggregants.” *Id.* at 10:10–12.

The specification further explains that “[c]onjugated polymers have proven useful as light gathering molecules in a variety of settings.” *Id.* at 1:49–50. In particular, “[w]ater-soluble conjugated polymers such as cationic conjugated polymers (CCPs) have been used in bioassays to improve detection sensitivity and provide new routes of selectivity in analyzing biomolecules.” *Id.* at 1:51–55. The molecular structure of those molecules are of interest in DNA and RNA detection methods because it “allows for a collective response and, therefore, optical amplification of fluorescent signals.” *Id.* at 2:32–37. Specifically, “[t]he large number of optically active units along the polymer chain increases the probability of light absorption, relative to small molecule counterparts.” *Id.* at 2:37–39. The presence of target DNA in a sample may be detected upon delivery of excitations to fluorophores, using facile fluorescence resonance energy transfer (FRET). *Id.* at 2:39–42.

The specification explains that “[r]ecent studies indicate that energy transfer between segments in conjugated polymers may be substantially more important than along the backbone” and that external perturbations that

decrease the elongation of the backbone, or that bring its segments closer together, may be used to modify emissive properties of the polymer in solution. *Id.* at 2:43–49. Based on that information, the specification states that the inventors recognized “a small number of fluorescent units within a polymer sequence could be activated by structural changes that compressed or aggregated the polymer chains to ultimately change the emission color,” and then designed a cationic conjugated polymer structure in accordance with that principle. *Id.* at 2:50–55. According to the specification, “[e]lectrostatic complexation with negatively charged DNA can be used to reduce the average intersegment distance. When combined with a fluorophore labeled peptide nucleic acid (PNA) strand, the polymer can be used to design a three color DNA detection assay.” *Id.* at 2:55–60.

C. Illustrative Claim

Of the challenged claims, claim 1 is independent and illustrative of the claimed subject matter. Claim 1 recites:

1. An aggregation sensor soluble in a polar medium comprising:

(a) a conjugated polymer comprising

a plurality of first optically active units forming a conjugated system, having a first absorption wavelength at which the first optically active units absorbs light to form an excited state, and

a plurality of solubilizing functionalities; and

(b) one or more second optically active units that can receive energy from the excited state of the first optically active unit;

said aggregation sensor comprising at least three first optically active units per second optically active unit;

wherein the second optically active unit is grafted to the conjugated polymer.

Ex. 1001, 37:45–60.

D. The Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–3, 6–12, 14–17, and 19 of the '673 patent based on the following grounds:

References	Statutory Basis	Claims Challenged
Yang ¹ and Wang ²	§ 103(a)	1, 3, 15, 16, 19
Yang, Wang, and the Handbook ³	§ 103(a)	2, 6
Yang, Wang, and Ingas ⁴	§ 103(a)	7–12, 14

See Pet. 18. Petitioner relies on the Declaration of Kirk S. Schanze, Ph.D. (Ex. 1002)⁵ to support its asserted grounds of unpatentability. Patent Owner disputes that Petitioner's asserted grounds render any of the challenged claims unpatentable. *See generally* Prelim. Resp. Patent Owner relies on the Declaration of Dwight Seferos, Ph.D. (Ex. 2008).

¹ Yang et al., *High-Efficiency Saturated Red-Emitting Polymers Derived from Fluorene and Naphthoselenadiazole*, 37 MACROMOLECULES 1211–1218 (2004) (“Yang”) (Ex. 1003).

² Wang et al., *Size-Specific Interactions Between Single- and Double-Stranded Oligonucleotides and Cationic Water-Soluble Oligofluorenes*, 13 ADV. FUNCT. MATER. 463–467 (2003) (“Wang”) (Ex. 1004).

³ Haugland, HANDBOOK OF FLUORESCENT PROBES AND RESEARCH PRODUCTS, 9th ed., Molecular Probes (2002) (“the Handbook”) (Ex. 1005).

⁴ Ingas et al., WO 2003/096016 A1, published Nov. 20, 2003 (“Ingas”) (Ex. 1006).

⁵ Petitioner includes the letters “TFS” with its exhibit numbers. We do not adopt that practice in this decision.

III. ANALYSIS

We organize our analysis into five sections. First, we discuss the level of ordinary skill in the art. Second, we turn to claim construction. Third, we address Yang's public accessibility and provide a summary of the asserted references. Fourth, taking account of the arguments and evidence presented, we consider whether the Petition meets the threshold showing for instituting an *inter partes* review based on obviousness. Fifth, we address Patent Owner's additional argument that we should exercise our discretion under 35 U.S.C. § 314(a) to deny institution based on the district court's schedule in the co-pending litigation.

A. Level of Ordinary Skill in the Art

Petitioner, relying on Dr. Schanze's testimony, asserts that a person of ordinary skill in the art at the time of the invention of the '673 patent would have had "knowledge of the scientific literature concerning methods of synthesizing fluorescent conjugated polymers and using these polymers for detecting aggregants." Pet. 7 (citing Ex. 1002 ¶ 11). In particular, Petitioner asserts,

Here, a POSA would typically have had (i) a Ph.D. in Chemistry, or a related field in the chemical sciences, and have at least about two years of experience in chemical synthesis and application of fluorescent conjugated polymers; or (ii) a Master's degree in the same fields with at least about five years of the same experience. Also, a POSA may have worked as part of a multidisciplinary team and drawn upon not only his/her own skills, but of others on the team, e.g., to solve a given problem. For example, a biochemist, molecular biologist and a clinician specializing in detection of biological molecules may have been part of a team.

Id. (citing Ex. 1002 ¶ 12).

Patent Owner asserts that a person of ordinary skill in the art would have possessed “a Ph.D. in chemistry or related fields and some experience with fluorescence or, alternatively, a master’s degree in chemistry or related fields and industry experience in the field of biological detection systems and/or the use and design of fluorescent dyes.” Prelim. Resp. 5.

The parties’ descriptions of the ordinarily skilled artisan are fairly the same, except for Petitioner’s description additionally recognizing a member of an unspecified multidisciplinary team as a person of ordinary skill in the art. Insofar as that additional description is vague, we decline to adopt it. Instead, for purposes of this decision, we determine that the remaining portion of Petitioner’s description of the level of ordinary skill in the art is sufficiently detailed and one that the current record supports. Thus, we recognize, for purposes of this decision, a person of ordinary skill in the art as one having either a Ph.D. in chemistry, or a related field in the chemical sciences, and having at least about two years of experience in chemical synthesis and application of fluorescent conjugated polymers, or a Master’s degree in the same fields with at least about five years of the same experience. We also note that the applied prior art reflects the appropriate level of skill at the time of the claimed invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Further, based on the information presented at this stage of the proceeding, we consider Drs. Schanze and Seferos, qualified to opine from the perspective of an ordinary artisan at the time of the invention. *See* Ex. 1027 (Dr. Schanze’s curriculum vitae); Ex. 2009 (Dr. Seferos’ curriculum vitae).

B. Claim Construction

For petitions filed before November 13, 2018, the Board interprets claims in an unexpired patent using the “broadest reasonable construction in light of the specification of the patent.” 37 C.F.R. § 42.100(b) (2016); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016).⁶ “Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history.” *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016).

Petitioner proposes that we adopt certain district court claim constructions for a number of claim terms. Pet. 14–16. In doing so, Petitioner provides the proposed constructions without any discussion or reference to the specification in support of them. In any event, we determine that no claim term requires express construction for purposes of this decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

C. Asserted References

Below, we provide a brief summary of the asserted references. Before doing so, however, we address Patent Owner’s argument that Petitioner does not establish sufficiently that Yang is prior art.

⁶ The Office recently changed the claim construction standard the Board applies in an *inter partes* review. *See Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51340 (October 11, 2018) (noting that the rule applies only to petitions filed on or after November 13, 2018).

1. Public Accessibility of Yang

The Federal Circuit has held that “public accessibility” is “the touchstone” in determining whether a reference is a printed publication. *In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986). “A given reference is ‘publicly accessible’ upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.” *SRI Int’l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008) (quoting *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006)).

It is apparent that both parties recognize January 31, 2005, the provisional application filing date, as the earliest priority date for challenged claims of the ’113 patent. *See* Pet. 11, 13–14 (using January 2005 as a reference point for what was known in the art); Ex. 1002 ¶¶ 3, 13 (Petitioner’s declarant describing the state of the art before January 31, 2005); Prelim. Resp. 5 (stating “the 113 patent’s earliest priority date of January 31, 2005”). Petitioner asserts that Yang is prior art under 35 U.S.C. § 102(b), contending that it was published on January 16, 2004. Pet. 17. In support of that assertion, Petitioner notes that the journal article includes a statement that it was “Published on Web 01/16/2004.” *Id.* n.3; Ex. 1003, 1211. Petitioner additionally relies upon the testimony of Dr. Schanze who confirms that date “refers to what was a common practice in 2004, and is still common today, the publication of an article on a journal’s website prior to the article appearing in the print version of the journal.” Ex. 1002 ¶ 67. According to Dr. Schanze, a person of ordinary skill in the art “would have

understood that this web publication date was the day the Yang reference was made publicly available.” *Id.*

Patent Owner disagrees and asserts that “[t]he Yang article published no earlier than February 24, 2004,” based upon date provided on the cover of the journal, along with the “Volume” and “Number” indications for the journal issue. Prelim. Resp. 5–7. Patent Owner notes also that the cover includes a date stamp by an unidentified library that the journal article was received on February 26, 2004. *Id.* at 6. Regarding the web publication information appearing in the article, Patent Owner asserts that Petitioner “did not affirmatively assert (nor could it) that exhibit TFS1003—the only version of the Yang article [Petitioner] relies on as prior art—was itself disseminated or otherwise made available to interested relevant artisans before February 24, 2004.” *Id.* at 8. Additionally, Patent Owner asserts that Petitioner “has not provided any documentary evidence that a document dated January 16, 2004 contained the same disclosure as the Yang article used as [Ex.] 1003.” *Id.* at 8–9. According to Patent Owner, the facts here align with those in *Pfizer, Inc. v. Biogen, Inc.*, Case IPR2017-01166, Paper 9 (PTAB Nov. 13, 2017), wherein the Board determined that Petitioner’s evidence was insufficient to establish, for purposes of the decision on institution, the public accessibility of an asserted reference. *Id.* at 7–9. Further, Patent Owner challenges Dr. Schanze’s testimony, asserting that it is “unsupported and conclusory.” *Id.* at 10.⁷

⁷ Patent Owner asserts also that Yang is not available as prior art under 35 U.S.C. § 102(a) based upon a contention that the inventors of the ’673 patent reduced to practice their invention prior to Yang’s critical date. Prelim. Resp. 5–6, 12–17. We do not address that contention in this Decision, as Petitioner asserts only that Yang is § 102(b) prior art.

Having considered the arguments and the evidence, we find that Petitioner has made a threshold showing that Yang was publicly accessible as a printed publication prior to the effective filing date of the '673 patent. To begin, we note that the facts involved here are distinguishable from those discussed in IPR2017-01166. The institution decision in that case involved a split panel. In the majority opinion, the Board determined that “none of the evidence proffered by Petitioner, either alone or in combination, suggests that the Rituxan Label was disseminated or otherwise made available to ordinarily skilled artisans exercising reasonable diligence prior to the critical date for the [patent at issue].” IPR2017-01166, Paper 9, 12. Such evidence is not missing here. Yang is an article in the *Macromolecules* journal. Ex. 1003, 2. The journal states that it is a publication of The American Chemical Society that is published biweekly. *Id.* Unlike with the Rituxan label at issue in IPR2017-01166, Petitioner has identified on the face of the article a disclosure by the publisher that the article was “Published on Web 01/16/2004.” Pet. 17 (citing Ex. 1003). Indeed, the exhibit includes the journal page describing its “Web Edition,” stating that “[t]his journal is available to subscribers via the Internet.” Ex. 1003, 2. Subscribers may be individual members, student members, or institutional customers, e.g., libraries. *See id.* at “2004 Subscription and Ordering Information.” Thus, based on the current record, we find that Yang, on its face, provides evidence suggesting that the same disclosure was available on the internet to subscribers on January 16, 2004.

Moreover, Petitioner provides persuasive testimonial evidence to support finding that Yang was made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising

reasonable diligence, could access it on the web publication date. *SRI Int'l, Inc.*, 511 F.3d at 1194. Based on the current record, we credit Dr. Schanze's testimony regarding the asserted common practice of publishing an article on a journal's website prior to the dissemination of the print version of the journal. Ex. 1002 ¶ 67. According to Dr. Schanze, a person of skill in the art would have understood the disclosed web publication date to be the day that Yang was made publicly available. *Id.* We find that Dr. Schanze is in a unique position to address the web publication practice of the "Macromolecules" journal, as he is "currently an editor for journals published by the American Chemical Society (ACS), the publisher of 'Macromolecules,'" and he affirms that he is "familiar with the ACS's publication policy in 2004." *Id.* ¶ 68. In particular, we credit Dr. Schanze's testimony that (a) articles were published on the "Macromolecules" website as of their web publication date, and are featured at the top of the webpage for the web publication section, and (b) subscribers to the "Macromolecules" journal receive email notifications of new articles appearing in the web publications sections of the journal website when new publications are posted. *Id.* Further, Dr. Schanze explains that as an editor of ACS journals, he was aware that the publisher would inform article authors that the web publication date is the date at which their article is considered to be published. *Id.* at ¶ 69. At this stage in the proceeding, we find no reason to question the veracity of Dr. Schanze's testimony in this regard.

Accordingly, based on the foregoing, we determine that Petitioner has made a sufficient threshold showing that Yang was publicly accessible on January 31, 2004, and is, therefore, recognized as prior art to the '673 patent under §102(b).

2. *Yang (Ex. 1003)*

Yang is a journal article discussing the synthesis of a “variety of novel light-emitting copolymers derived from 9,9-dioctylfluorene (DOF) and 2,1,3-naphthoselenadiazole (NSeD).” Ex. 1003, Abstract. The polymers are “soluble in common organic solvents and highly fluorescent in solid state.” *Id.* Yang explains that “polymer light-emitting diodes (PLEDs) have attracted considerable interest because of their potential application in flat panel displays.” *Id.* at 1211. According to Yang, “[i]t is believed that PLED technology is one of the most promising for next generation large-area flat panel displays.” *Id.* Yang explains that “[s]ignificant efforts have been made to tune color to longer wavelength for fluorene-based polymers,” and that “[c]ompared with a high-efficiency green polyfluorene emitter reported in the scientific literature, the polymer emitter with saturated red emission remains a great challenge.” *Id.* Yang further discloses that emission color of polyfluorenes may be tuned over an entire visible region by incorporating narrow band-gap comonomer into the polyfluorene backbone. *Id.*

Yang describes synthesizing its novel copolymers using the palladium-catalyzed Suzuki coupling method. *Id.* at 1211–1212. Yang teaches that the “2,1,3-naphthoselenadiazole unit in the copolymer is isolated from both sides by fluorene host segment functions as a powerful exciton trap which allows efficient intramolecular energy transfer from the fluorene segment to the NSeD unit.” *Id.* at 1212. Yang reports that “EL [electroluminescence] emission from [the fluorene] segment was completely quenched at very low NSeD content (0.5%). Saturated red emission at the maximum wavelength of 657 nm was obtained.” *Id.*

3. *Wang (Ex. 1004)*

Wang is a journal article discussing an “improved synthetic approach” for developing “molecules provid[ing] a size-specific series of water-soluble oligofluorene molecules with increasing numbers of repeat units to model the interactions between cationic conjugated polymers and DNA.”

Ex. 1004, Abstract. Wang teaches that “[c]onjugated polymers can be used as the optical platform in fluorescent chemical and biological sensors.” *Id.* at 463. Wang states that “[s]olubility in water is essential for interfacing with biological substrates such as proteins and DNA, and this property is achieved by attaching charged functionalities as pendant groups on the conjugated backbone.” *Id.* Wang describes how various phenomena in complex biological mixtures allow for rational design of quantitative conjugated polymer-based DNA assays. *Id.* For example, Wang states, “[i]n the case of conjugated polymers, it is likely that aggregation of the fluorophores within the vicinity of DNA influences their optical properties by mechanisms such as relaxation or contraction of the polymer secondary structure, self-quenching, and photoinduced charge transfer to the DNA bases.” *Id.*

4. *The Handbook (Ex. 1005)*

Chapter 1 of the Handbook discusses fluorophores and their amine-reactive derivatives. Ex. 1005, Table of Contents. Section 1.2 of that chapter describes kits for labeling proteins and nucleic acids with a fluorescent dye. *Id.* at 14. In particular, the Handbook describes three nucleic acid labeling kits: ARES DNA Labeling Kits, Alexa Fluor Oligonucleotide Amine Labeling Kits, and ULYSIS Nucleic Acid Labeling Kits. *Id.* at 18.

5. *Inganas (Ex. 1006)*

Inganas is a PCT Application directed to “methods for detection of biomolecular interactions through the detection of alterations of the intra- and inter-chain processes in materials based on zwitterionic conjugated polyelectrolytes.” Ex. 1006, 1:6–8. Inganas explains that conjugated polymers such as poly(thiophene) and poly(pyrrole) are useful as biosensors because they are “sensitive to very minor perturbations, due to amplification by a collective system response.” *Id.* at 1:15–18. Inganas states that such use of conjugated polymers requires that they are “compatible with aqueous environment.” *Id.* at 1:20–21. Inganas explains that this may be accomplished by making conjugated polyelectrolytes. *Id.* at 1:21–23. “[T]he polyelectrolyte comprises copolymers or homopolymers of thiophene, pyrrole, aniline, furan, phenylene, vinylene or their substituted forms, and preferably the conjugated polyelectrolyte has one or more zwitterionic side chain functionalities.” *Id.* at 3:1–4.

D. Petitioner’s Challenges to the ’673 Patent

We now consider whether the Petition meets the threshold showing for instituting an *inter partes* review based on obviousness. “An obviousness determination requires that a skilled artisan would have perceived a reasonable expectation of success in making the invention in light of the prior art.” *Amgen, Inc. v. F. Hoffman–La Roche Ltd.*, 580 F.3d 1340, 1362 (Fed. Cir. 2009). “The reasonable expectation of success requirement refers to the likelihood of success in combining references to meet the limitations of the claimed invention.” *Intelligent Bio-Sys, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016). “[O]ne

must have a motivation to combine accompanied by a reasonable expectation of achieving what is claimed in the patent-at-issue.” *Id.*

1. Asserted Obviousness over Yang and Wang

Petitioner asserts that claims 1, 3, 15, 16, and 19 of the '673 patent would have been obvious over the combination of Yang and Wang. Pet. 18–43. Patent Owner disagrees. Prelim. Resp. 17–47.

(a) The parties' assertions

Petitioner asserts that “Yang and Wang teach all the elements of claim 1.” Pet. 18. According to Petitioner, Yang teaches a conjugated copolymer comprising a plurality of first units, i.e., 9,9-dioctylfluorene monomers, forming a conjugated system (PFO), and one or more second units, NSeD. *Id.* at 19–20 (citing Ex. 1002 ¶¶ 70, 73–75; Ex. 1003, 3:1:2–4:2:1).

Petitioner and Dr. Schanze assert that a person of skill in the art would have understood that the fluorene units are optically active, absorb light at a first absorption wavelength, 390 nm, and form an exciton. *Id.* at 21–22 (citing Ex. 1003, 4:2:2, 5:Table 2 and Fig. 1, 7:Table 4; Ex. 1002 ¶ 78). Petitioner and Dr. Schanze further assert that Yang’s NSeD unit is also optically active and “functions as a powerful exciton trap which allows efficient intramolecular energy transfer from the fluorene segment to the NSeD unit.” *Id.* at 22 (quoting Ex. 1003, 4:1:1, 5:2:2, 6:1:1; citing Ex. 1002 ¶ 79).

Petitioner asserts also that Yang discloses that its PFO-NSeD copolymers have at least three first optically active units per second optically active unit, as “[t]he comonomer ratios of PFO to NSeD are 99.9:0.1, 99.5:0.5, 99:1, 98:2, 95:5, and 85:15.” *Id.* at 23 (quoting Ex. 1003, 4:1:3). Petitioner additionally asserts that in Yang, the NSeD is grafted to the conjugated polymer. *Id.* at 24–25 (citing Ex. 1003, 4:Scheme 2; Ex. 1002 ¶¶ 70, 81).

Petitioner relies on both Yang and Wang as each teaching aggregation sensors soluble in a polar medium comprising conjugated polymers, with the conjugated polymers comprising a plurality of solubilizing functionalities. *Id.* at 24–30 (citing Ex. 1002 ¶¶ 82–89; Ex. 1003, 4:1:3, 5:2:2, 6:1:1, 7:Fig. 3(b); Ex. 1004 Abstract, 3:1:1–3:1:2, 5:1:1–5:1:3, 5:Fig. 1). However, Petitioner explains that Yang’s conjugated polymers are not water-soluble, whereas Wang’s conjugated polymers are water-soluble. *Id.* at 28–29. Further, as Yang describes using its conjugated polymers in flat panel displays and not as biosensors, Ex. 1003, 1212, Petitioner relies upon Wang as disclosing using oligofluorenes to detect unlabeled DNA by observing changes in the optical properties of the oligofluorene when they bind and aggregate in the vicinity of DNA. Pet. 27, 32–34 (citing Ex. 1004, 3:1:1–2, 5:1:3, 5:Fig. 1, 5:Fig. 2; Ex. 1002 ¶¶ 85–86, 95). Petitioner asserts that “Wang’s system detects unlabeled DNA by observing quenching of oligofluorene’s fluorescence (i.e., decrease in emission intensity).” *Id.* at 32 (citing Ex. 1004, 5:Fig. 1, 5:Fig. 2; Ex. 1002 ¶ 95). According to Petitioner and Dr. Schanze, that method of detection is “not very practical or reliable when a sample contains a small amount of an analyte, because they require equipment sensitive enough to detect minor changes in emission.” *Id.* (citing Ex. 1002 ¶ 95).

Petitioner asserts that Yang’s copolymers, on the other hand, show color changes when aggregated. Pet. 32. For example, Petitioner asserts that “NSeD emission in Yang’s PFO-NSeD5 ‘increased dramatically’ when concentrated in solution,” resulting in “an increase in red emission, while diminishing violet emission (albeit not completely).” *Id.* (quoting Ex. 1003, 5:2:2; citing *id.* at 7:Fig. 3; Ex. 1002 ¶ 96). Petitioner asserts that in the

solid state, the color change was enhanced, with violet emission disappearing completely. *Id.* (citing Ex. 1003, 6:1:1, 7:Fig. 3). Petitioner asserts that a person of ordinary skill in the art “would have understood that Yang’s copolymers offered unique optical advantages over Wang’s oligofluorenes vis-à-vis their response to aggregation.” *Id.* at 33.

Petitioner further asserts that because Wang teaches “[s]olubility in water is essential for interfacing [conjugated polymers] with biological substrates such as proteins and DNA,” Pet. 34 (quoting Ex. 1004, 3:1:1) a person of ordinary skill in the art would have had a reason to modify Yang’s copolymers to be water-soluble to allow their use in Wang’s system. *Id.* (citing Ex. 1002 ¶ 101). According to Petitioner and Dr. Schanze, a skilled artisan would have done so in the same manner Wang describes, i.e., attaching Wang’s cationic functionalities onto Yang’s fluorene monomers prior to combining them with NSeD. *Id.* at 34–36 (citing Ex. 1002 ¶¶ 102–109).

Petitioner and Dr. Schanze further assert that the skilled artisan would have had a reasonable expectation of successfully preparing Yang’s copolymers comprising Wang’s solubilizing functionalities because “Wang and Yang teach chemical routes for attaching two solubilizing functionalities to each fluorene monomer at position 9 of fluorene: octane (Yang) and trimethylaminehexane (Wang).” Ex. 1002 ¶ 106 (citing Ex. 1004, 4:Scheme 2; Ex. 1003, 4:1:2–4:2:1); Pet. 36. Additionally, Petitioner asserts that a person of ordinary skill in the art would have had a reasonable expectation that the modified copolymers would function as aggregation sensors and would not lose their color-changing properties upon being made cationic. Pet. 37–38. Specifically, Petitioner asserts that adding Wang’s

solubilizing cationic functionalities to Yang's copolymer "would not unduly disturb energy transfer from the first units (PFO) to the second units (NSeD) in Yang's copolymer." *Id.* at 38. In support of that assertion, Petitioner states that "it was known that adding similar water-solubilizing groups to a polyfluorene did not impair its photoluminescent properties to an impermissible extent." *Id.* (citing Ex. 1072,⁸ 7:2:1; Ex. 1002 ¶ 114). Further, Petitioner asserts that "Dr. Schanze confirms that the energy transfer profile of Yang's solubilized polymer would not be impaired unduly in water compared to Yang's organic solvents." *Id.* at 38–39 (citing Ex. 1002 ¶ 114; Ex. 1009,⁹ 3:1:2; Ex. 1040,¹⁰ 3:1:3).

Patent Owner asserts, among other things, that Petitioner has not established that a person of ordinary skill in the art would have had a reasonable expectation of success in using Yang's modified copolymers as aggregation sensors in Wang's method. Prelim. Resp. 43. In particular, Patent Owner asserts that Petitioner fails to adequately support its assertions that "'making Yang's copolymers cationic would not abolish their color-changing properties' and that 'adding solubilizing functionalities would not unduly disturb energy transfer from the first units (PFO) to the second units (NSeD) in Yang's copolymer.'" *Id.* at 44 (quoting Pet. 38). Patent Owner

⁸ Liu et al., *Blue-Light-Emitting Cationic Water-Soluble Polyfluorene Derivatives with Tunable Quaternization Degree*, 357 MACROMOLECULES 4975–4982 (2002) ("Liu") (Ex. 1072).

⁹ Harrison et al., *Amplified Fluorescence Quenching in a Poly(p-phenylene)-Based Cationic Polyelectrolyte*, 122 J. A. CHEM. SOC. 8561–8562 (2000) ("Harrison") (Ex. 1009).

¹⁰ Tan et al., *Photophysics, aggregation and amplified quenching of a water-soluble poly(phenylene ethynylene)*, CHEM. COMM. 444–447 (2002) ("Tan") (Ex. 1040).

notes that Petitioner relies upon Dr. Schanze's testimony to support those contentions, however, the declaration testimony Petitioner cites merely parrots Petitioner's argument. *Id.* (citing Ex. 1002 ¶ 114).

Similarly, Patent Owner asserts that Petitioner has not adequately supported its assertion that "it was known that adding similar water-solubilizing groups to a polyfluorene did not impair its photoluminescent properties to an impermissible extent." Prelim. Resp. 44 (quoting Pet. 38). Here, Patent Owner notes that Petitioner and Dr. Schanze cite Liu as supporting that contention, but "fail to state the relevance or identify specific portions of the citation that supposedly supports their argument." *Id.* at 44–45 (citing Pet. 38; Ex. 1002 ¶ 114). Patent Owner asserts that even upon examining the cited portions of the reference, i.e., Ex. 1072, 7:2:1 and Abstract, it is unclear how Petitioner draws support from those disclosures for its argument. Prelim. Resp. 45. Moreover, Patent Owner asserts that a person of ordinary skill in the art "would not have turned to Liu to understand whether the copolymers disclosed in Yang would have experienced impaired fluorescence in aqueous solution" because the polymers studied in Liu are different from those disclosed in Yang. *Id.* at 45–46. In particular, Patent Owner notes that Liu's polymer includes a phenyl unit, whereas Yang's copolymer does not, and that Liu teaches modifying the phenyl unit (not the fluorene unit) to increase water solubility. *Id.* at 46 (citing Ex. 1072, 4977, col. 2).

Additionally, Patent Owner asserts that Petitioner fails to adequately support its assertion that solubilizing Yang's copolymers "would not impair the copolymers' photoluminescent properties to 'an impermissible extent,' and additionally, that the copolymers' energy transfer profile would not be

‘impaired unduly.’” *Id.* (quoting Pet. 38). Patent Owner notes that Petitioner “does not explain, however, what is meant by ‘impermissible extent’ or ‘impaired unduly,’ nor how these vague terms are measures of a [skilled artisan’s] reasonable expectation of success in making and using Yang’s copolymers as [Petitioner] has proposed.” *Id.* According to Patent Owner, “implicit in these statements is [Petitioner’s] acknowledgement that energy transfer and photoluminescent properties would be impaired.” *Id.* at 46–47. Patent Owner asserts that “[s]uch vague and conclusory assertions cannot be the basis for establishing that a [skilled artisan] would have had a reasonable expectation of success in modifying Yang’s copolymers in the manner [Petitioner] proposes.” *Id.* at 47.

(b) Analysis

Having considered the arguments and evidence, we find Patent Owner’s arguments to have merit. In particular, we agree with Patent Owner that Petitioner does not adequately demonstrate that a person of ordinary skill in the art would have had a reasonable expectation of successfully using Yang’s modified copolymers in Wang’s aggregation sensor. Indeed, Petitioner merely asserts that such an expectation would exist without adequately supporting that contention with persuasive evidence.

According to Petitioner, a person of ordinary skill in the art would have been motivated to use Yang’s copolymers in Wang’s aggregation sensor because “Yang’s copolymers offered unique optical advantages over Wang’s oligofluorenes vis-à-vis their response to aggregation,” i.e., color changes. Pet. 33. According to Petitioner, the skilled artisan would have understood from Wang that in order for Yang’s copolymers to be useful as

aggregation sensors in the method disclosed by Wang, Yang's copolymers would need to be modified in a manner that renders them water-soluble. *Id.* at 34. In that regard, Petitioner and Dr. Schanze acknowledge that Wang teaches "[s]olubility in water is essential for interfacing [conjugated polymers] with biological substrates such as proteins and DNA." *Id.* (quoting Ex. 1004, 3:1:1); Ex. 1002 ¶ 101. To achieve such water solubility, Petitioner asserts that a skilled artisan would have attached Wang's cationic functionalities onto Yang's fluorene monomers at position 9 of the fluorene. *Id.* at 36–37; Ex. 1002 ¶¶ 106–107.

Thus, for a person of ordinary skill in the art to have had a reasonable expectation of successfully combining the references to meet the limitations of claim 1, *see Intelligent Bio-Sys.*, 821 F.3d at 1367, the artisan must have reasonably expected that Yang's copolymers could be modified in the manner Petitioner proposes to render them water-soluble, without such modification diminishing the color-changing properties of the copolymer, such that the modified copolymers may be used in Wang's aggregation sensor. Petitioner asserts that such is the case. According to Petitioner, Dr. Schanze and Liu confirm that point. *See* Pet. 38 (citing Ex. 1072, 7:2:1; Ex. 1002 ¶ 114). Specifically, Dr. Schanze states:

[A] POSA in January 2005 would have had a reasonable expectation that solubilizing Yang's copolymers by adding cationic functional groups would not destroy the emission color changing properties of the copolymers. More specifically, a POSA would not expect that the addition of solubilizing functionalities would disrupt energy transfer between the first (PFO) and second (NSeD) optically active units in Yang's copolymer. For example, it was known in 2005 that addition of similar water-solubilizing groups to a polyfluorene did not impair its photoluminescent properties in a significant way. TFS1072, Abstract.

Ex. 1002 ¶ 114. As seen, Dr. Schanze supports that testimony only by citing to the Abstract of "TFS1072," i.e., Ex. 1072 (Liu), without discussing or explaining how that reference corroborates his contentions. Thus, we do not afford his opinion on this matter persuasive weight. *See* 37 C.F.R.

§ 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight."). The Petition similarly lacks such discussion.

Based upon our review of Liu, we agree with Patent Owner that it is unclear which teaching in that reference Petitioner and Dr. Schanze rely upon, or why, especially in view of the fact that Liu is directed to different copolymers than those disclosed in Yang, and Liu teaches that its polymers were modified in a different manner than Petitioner proposes for Yang, i.e., by modifying the phenyl unit (absent from Yang's copolymer) rather than the fluorene unit. *See* Ex. 1072, 4977.

For at least these reasons, based on the information presented, we determine that Petitioner does not demonstrate a reasonable likelihood of prevailing in showing that independent claim 1, or dependent claims 3, 15, 16, and 19, of the '673 patent are unpatentable over the proposed combination of Yang and Wang.

2. Asserted Obviousness over Yang, Wang, and the Handbook

Petitioner asserts that dependent claims 2 and 6 would have been obvious over the combination of Yang, Wang, and the Handbook. Pet. 43–51. For these claims, Petitioner relies upon the combination of Yang and Wang in the same manner discussed above in Section II. D.1. and includes the Handbook to address the additional limitations in those dependent claims. *See id.* Specifically, Petitioner relies on the same proposed modification to solubilize Yang’s copolymer and the same use of the modified copolymer in Wang’s aggregation sensor, as relied upon in the ground challenging independent claim 1 over Yang and Wang. *Id.*; *see* Ex. 1002 ¶ 133. Petitioner does not provide any additional rationale or evidence to support its contention that a person of ordinary skill in the art would have reasonably expected to successfully arrive at the claimed invention using Yang’s copolymer, modified in the proposed manner. *See* Pet. 43–51. Thus, Petitioner fails to establish a reasonable expectation of successfully modifying Yang’s copolymers in the manner proposed without interfering with its “color-changing” properties so as to allow them to be used in Wang’s aggregation sensor for at least the same reason discussed in Section II. D.1. Accordingly, based on the information presented, Petitioner does not demonstrate a reasonable likelihood of prevailing in showing that dependent claims 2 and 6 of the ’673 patent are unpatentable over the proposed combination of Yang, Wang, and the Handbook.

3. Asserted Obviousness over Yang, Wang, and Inganas

Petitioner asserts that dependent claims 7–12 and 14 would have been obvious over the combination of Yang, Wang, and Inganas. Pet. 51–63. For

these claims, Petitioner also relies upon the combination of Yang and Wang in a similar manner discussed above in Section II. D.1, except that Petitioner proposes solubilizing Yang's copolymers by adding Inganas' zwitterionic functionalities instead of using Wang's cationic functionalities. *See id.* In doing so, Petitioner continues to rely upon Wang as teaching the chemical route for attaching solubilizing functionalities onto Yang's copolymer, i.e., onto the fluorene monomers at position 9 of fluorene. *Id.* at 58.

Petitioner further relies upon Dr. Schanze's testimony to assert that the "zwitterionic nature of the solubilizing functionalities would not alter the ability of PFO to efficiently transfer energy to NSeD in the aggregated state because the functionalities would not perturb the conjugated nature of the copolymer." Pet. 60 (citing Ex. 1002 ¶ 173). However, Dr. Schanze's testimony simply repeats Petitioner's assertion without providing any explanation or evidence for support. Ex. 1002 ¶ 173. As such, we do not afford that opinion persuasive weight. *See* 37 C.F.R. § 42.65(a). Therefore, Petitioner does not establish sufficiently that a skilled artisan would have had a reasonable expectation of successfully modifying Yang's copolymers in the manner proposed. Accordingly, based on the information presented, we determine that Petitioner does not demonstrate a reasonable likelihood of prevailing in showing that dependent claims 7–12 and 14 of the '673 patent are unpatentable over the proposed combination of Yang, Wang, and Inganas.

E. Patent Owner's Arguments Based Upon the District Court Schedule

Patent Owner argues that the Board should deny the Petition based upon the current status of the co-pending district court litigation. Prelim. Resp. 47. In particular, Patent Owner explains that the district court has

scheduled trial to begin on May 14, 2019. *Id.* According to Patent Owner, based upon the filing timing of the Petition and Preliminary Response in this proceeding, if the Board institutes an *inter partes* review, “the final written decision would be due 6–8 months after the district court had already resolved the litigation between the parties on this patent, and well before the briefings in the IPR are complete.” *Id.* at 47–48. Patent Owner contends that Petitioner delayed filing its Petition until the eve of the statutory deadline though fully aware that the district court had already scheduled the May 14, 2019 trial date. *Id.* at 48.

Patent Owner also notes that the district court has issued a claim construction order and that Petitioner proposes that we apply those same constructions in this proceeding. *Id.* Patent Owner asserts also that the district court litigation includes Petitioner’s allegations of invalidity of the ’673 patent based upon the same references asserted in the Petition. *Id.* at 47 n.2. Thus, Patent Owner asserts that the Board should exercise its discretion under 35 U.S.C. § 314(a) to deny institution because an *inter partes* review would “evaluate the same references under the same claim construction as the district court, and is clearly just an attempt by [Petitioner] to have a second bite at the apple in the event they lose at the district court.” *Id.* at 48–49. According to Patent Owner, instituting an *inter partes* review would be “an inefficient use of the Board’s resources” and require the parties to expend significant resources in an essentially redundant proceeding. *Id.* at 49.

Based on the circumstances involved, we agree with Patent Owner that instituting a trial would be an inefficient use of Board resources. The district court proceeding, in which Petitioner asserts the same prior art, is

nearing its final stages. The district court has entered its claim construction order. Ex. 1012. Petitioner proposes that we adopt those constructions in this proceeding. *See* Pet. 14–16. Expert discovery ended in the district court litigation on January 24, 2019. Ex. 2004, 15. Further, the court has scheduled trial for May 14, 2019. *Id.* at 18. An *inter partes* review on the same asserted prior art would not conclude until long after that time, with a Final Written Decision due in February 2020. Thus, under these circumstances, we consider that an *inter partes* review would not be consistent with “an objective of the AIA . . . to provide an effective and efficient alternative to district court litigation.” *General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, Case IPR2016-01357 (Paper 19, 16–17) (PTAB Sept. 6, 2017) (precedential as to § II.B.4.i). Accordingly, we find that the advanced stage of the pending district court proceeding, along with the similarities involved in that proceeding and the Petition, warrant additionally denying the Petition under § 314(a).

IV. CONCLUSION

For the foregoing reasons, we conclude that the information presented in the Petition does not establish a reasonable likelihood that Petitioner would prevail in showing the unpatentability of at least one of the challenged claims of the ’673 patent based upon the grounds presented. Moreover, based on the advanced stage of the pending district court proceeding, along with the similarities regarding the claim construction, claim challenges, and cited art involved in that proceeding and asserted in the Petition, we determine that a trial would be an inefficient use of Board resources.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied*, and no trial is instituted.

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