

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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PEROXYCHEM LLC,  
Petitioner,

v.

INNOVATIVE ENVIRONMENTAL TECHNOLOGIES, INC.,  
Patent Owner.

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Case PGR2016-00002  
Patent 9,126,245 B2

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Before ZHENYU YANG, CHRISTOPHER M. KAISER, and  
JEFFREY W. ABRAHAM, *Administrative Patent Judges*.

YANG, *Administrative Patent Judge*.

DECISION  
Institution of Post-Grant Review  
*37 C.F.R. § 42.208*

## INTRODUCTION

PeroxyChem LLC (“Petitioner”) filed a Petition (Paper 1, “Pet.”), requesting post-grant review of claims 1–26 of U.S. Patent No. 9,126,245 B2 (Ex. 1001, “the ’245 patent”). Innovative Environmental Technologies, Inc. (“Patent Owner”) did not file a preliminary response.

We review the Petition under 35 U.S.C. § 324, which provides that post-grant review shall not be instituted unless “the information presented in the petition filed under section 321, if such information is not rebutted, would demonstrate that it is more likely than not that at least 1 of the claims challenged in the petition is unpatentable.” 35 U.S.C. § 324(a).

For the reasons provided below, we determine that Petitioner has demonstrated that it is more likely than not that at least one claim of the ’245 patent is unpatentable. Because Petitioner has satisfied the threshold requirement set forth in 35 U.S.C. § 324(a), we institute a post-grant review of claims 1–26 of the ’245 patent.

### *The ’245 Patent*

The ’245 patent relates to the oxidation and biological attenuation of organic compounds in soil and groundwater. Ex. 1001, 1:10–14. According to the ’245 patent, “[t]he use of in-situ or introduced metals in the trivalent state as the activation chemical allows for application of the activation chemical, either concurrently or sequentially, with the persulfate and provides for both the desired activation of the persulfate and the controlled reaction within the targeted treatment zone without migration.”

*Id.* at 3:24–29. In addition, the '245 patent states that “[t]he incorporation of a biological component in the remedial process allows for a single treatment as compared to other persulfate activation processes which requires additional oxidation events to fully treat the sorbed phases of the targeted compounds.” *Id.* at 1:28–32.

*Illustrative Claim*

Among the challenged claims, claims 1 and 15 are independent.

Claim 1 is illustrative. It reads:

1. A method for chemical oxidation followed by a biological attenuation process of an environmental medium containing one or more contaminants, the method comprising,

introducing persulfate and one or more trivalent metals into the environmental medium, wherein the one or more trivalent metals activate the persulfate in order to chemically oxidize the one or more contaminants, wherein amount of the persulfate is selected to chemically oxidize the one or more contaminants and amount of the one or more trivalent metals is between approximately 17–30% of molecular weight of the persulfate so that at conclusion of the chemical oxidation sufficient residual sulfate and sufficient residual trivalent metals remain such that:

naturally occurring facultative cultures utilize the residual sulfate and the residual trivalent metal as terminal electron acceptors to promote the biological attenuation process of the one or more contaminants; and

the residual sulfate and the residual trivalent metal prevent formation and accumulation of hydrogen sulfide which is a toxin to the facultative cultures.

*Asserted Grounds of Unpatentability*

Petitioner asserts the following grounds of unpatentability:

1. claims 1–26 as unpatentable under 35 U.S.C. § 112(a) for lack of adequate written-description support;
2. claims 1–26 as unpatentable under 35 U.S.C. § 112(a) for lack of enablement;
3. claims 1–6, 8, 9, 12, 13, 15, 18, and 19 as obvious over Valenti;<sup>1</sup>
4. claims 10 and 20–22 as obvious over Valenti and Kennedy;<sup>2</sup>
5. claims 11 and 16 as obvious over Valenti and the '152 patent;<sup>3</sup>
6. claims 17 and 23–26 as obvious over Valenti and Peroxygen Talk 2010;<sup>4</sup>

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<sup>1</sup> Valenti et al., *Implementation and Evaluation of an Innovative Treatment of Xylenes and Naphthalene Using Oxidation and Biological Mechanisms*, Paper C-11, In Situ and On-Site Bioremediation—2009, Tenth International In Situ and On-Site Bioremediation Symposium (Baltimore, MD; May 5–8, 2009) (Ex. 1004, “Valenti”).

<sup>2</sup> Kennedy et al., *Field-Scale Demonstration of Induced Biogeochemical Reductive Dechlorination at Dover Air Force Base, Dover, Delaware*, 88 J. of CONTAMINANT HYDROLOGY 119–36 (2006) (Ex. 1006, “Kennedy”).

<sup>3</sup> Scalzi and Meese, U.S. Patent No. 7,044,152 B2, issued May 16, 2006 (Ex. 1005, “the '152 patent”).

<sup>4</sup> FMC Environmental Solutions, *Activated Persulfate Chemistry: Combined Oxidation and Reduction Mechanisms*, archived at Wayback Machine on November 2, 2010 (Ex. 1008, “Peroxygen Talk 2010”).

7. claim 14 as obvious over Valenti and Walling;<sup>5</sup> and
8. claims 1–26 as unpatentable under 35 U.S.C. § 101 for claiming patent-ineligible subject matter.

In support of its patentability challenge, Petitioner relies on the Declaration of John A. Bergendahl, Ph.D. Ex. 1003.

## ANALYSIS

### *Eligibility for Post-Grant Review*

The '245 patent issued on September 8, 2015, from an application filed on May 10, 2013. Ex. 1001, (22), (45). It does not claim the benefit of any earlier filing date. Because it issued from an application that contains a claim with an effective filing date after March 16, 2013, the '245 patent is available for post-grant review. *See Leahy-Smith America Invents Act* (Pub. L. No. 112-29, 125 Stat. 284 (2011), §§ 3(n)(1), 6(f)(2)(A).

The Petition was filed on November 19, 2015 (Paper 3, 1), within nine months of the grant of the '245 patent. *See* 35 U.S.C. § 321(c). Petitioner further certifies that it has standing to seek a post-grant review of the '245 patent. Pet. 7.

### *Claim Construction*

In a post-grant review, we interpret a claim term in an unexpired patent according to its broadest reasonable construction in light of the specification of the patent in which it appears. 37 C.F.R. § 42.200(b); *see*

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<sup>5</sup> C. Walling, *Fenton's Reagent Revisited*, 8 ACC. CHEM. RES. 125–31 (1975) (Ex. 1011, “Walling”).

*also In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1281 (Fed. Cir. 2015) *cert. granted sub nom. Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 890 (mem.) (2016). Under that standard, and absent any special definitions, we assign claim terms their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention, in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Claim terms need only be construed to the extent necessary to resolve the controversy. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). For purposes of this Decision, we determine that no terms require express construction.

#### *The Written-Description Ground*

Petitioner argues that claims 1–26 are unpatentable under 35 U.S.C. § 112(a) because the Specification of the '245 patent does not provide adequate written-description support. Pet. 35–40. Based on the current record, we determine Petitioner has established that, more likely than not, it would prevail in this assertion.

Claim 1 recites “introducing persulfate and one or more trivalent metals into the environmental medium . . . wherein . . . [an] amount of the one or more trivalent metals is between approximately 17–30% of molecular weight of the persulfate.” Ex. 1001, 7:14–21. Claim 15 recites the same limitation. *Id.* at 8:11–20. As Petitioner points out, this limitation was added in response to the final rejection during prosecution. *See* Pet. 17 (citing Ex. 1002, 22–34). According to Petitioner, “[t]he newly claimed

ratio of 17–30% of trivalent metals to persulfate is not described in the specification.” *Id.* at 18. Instead, the applicant, in the Remarks section of the response to the final rejection, set forth 13 steps to explain how the ratio was derived. *Id.* (citing Ex. 1002, 30–31).

Petitioner contends that the “Thirteen Steps, submitted concurrently with the added subject matter in independent Claims 1 and 15 . . . include several significant assumptions and requirements that are not found in the claims or the specification.” *Id.* at 38. For example, Petitioner points out that various steps require sodium persulfate as the persulfate and iron as the metal. *Id.* (citing Ex. 1002, 30–31). These assumptions and requirements, however, according to Petitioner, are not supported by the Specification. *Id.* (citing Ex. 1001, 4:4–5 (disclosing that trivalent metal irons include manganese ( $Mn^{3+}$ )), 5:34–35 (disclosing sodium, potassium, and ammonium salts as persulfates)). In addition, Petitioner argues that “step 13 assumes an arbitrary ‘25% range’ in calculating the claimed ratio.” *Id.* at 39. As a result, Petitioner asserts the “Thirteen Steps . . . confirm that the original specification did not contain a written description of the invention that is sufficiently detailed so that a POSA can reasonably conclude that the inventors had possession of the full scope of such claims on May 10, 2013,” the filing date of the application that issued as the ’245 patent. *Id.* at 38. We find Petitioner’s argument persuasive at this stage of the proceedings.

To satisfy the written-description requirement, the specification, within its “four corners,” must reasonably convey to those skilled in the art that the inventor had possession, “as shown in the disclosure,” of the

claimed subject matter as of the filing date. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). Based on the current record, we are persuaded by Petitioner’s argument that the Specification of the ’245 patent does not meet this standard.

Of course, in some instances, a patentee can rely on information that is well known in the art to satisfy the written-description requirement. *Id.* (“[T]he level of detail required to satisfy the written-description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.”). The record before us, however, does not show that the 17–30% ratio would have been within the knowledge of one of ordinary skill in the art.

In sum, based on the current record, we are persuaded that it is more likely than not that the challenged claims are unpatentable under 35 U.S.C. § 112(a) because the Specification of the ’245 patent does not provide adequate written-description support, at least for the 17–30% ratio recited in the claims.

#### *The Enablement Ground*

Petitioner argues that claims 1–26 are unpatentable under 35 U.S.C. § 112(a) because the Specification of the ’245 patent fails to comply with the enablement requirement. Pet. 40–41. Based on the current record, we determine Petitioner has not established that, more likely than not, it would prevail in this assertion.

Specifically, Petitioner argues that the Specification of the ’245 patent “fails to describe the necessary environmental conditions, and

necessary parameters, that must be present in order for the claimed chemical reactions to take place, or how a POSA would select or identify the appropriate environmental conditions.” Pet. 41. Petitioner also repeats the assertion that “neither the specification, nor the claims, discloses or contains the assumptions and requirements that the Patent Owner alleged as providing written-description support for the newly added subject matter during prosecution.” *Id.* As a result, Petitioner concludes the Specification of the ’245 patent fails to comply with the enablement requirement. We are not persuaded.

First, under § 112(a), enablement is separate and distinct from the written-description requirement. *Ariad*, 598 F.3d at 1344. Petitioner’s argument asserting lack of enablement, however, merely refers to its written-description challenge. *See* Pet. 41.

Second, “[t]he test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation.” *United States v. Telectronics, Inc.*, 857 F.2d 778, 785 (Fed. Cir. 1988). Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). These factors include, for example, the nature of the invention, the state of the prior art, the level of one of ordinary skill, the level of predictability in the art, and the amount of direction provided by the inventor. *Id.*

Petitioner does not provide proper enablement analysis based on the *Wands* factors. And we cannot conclude from the information set forth in the Petition that Petitioner is more likely than not to prevail in its enablement challenge. Indeed, Petitioner alleges that an ordinary artisan at the time of the '245 patent invention would have had relevant education and work experience in the field of groundwater and/or soil contaminant treatment. Pet. 23. In addition, according to Petitioner, at the time of the '245 patent invention, the pertinent art of groundwater or soil contaminant treatment was “fairly well-developed” and included various treatment processes using techniques such as chemical oxidation and anaerobic biodegradation. *Id.* at 31. Specifically, Petitioner asserts that “it was widely known” that persulfate could be activated to produce sulfate free radicals to chemically oxidize contaminants. *Id.* at 25. Petitioner also contends that “it was known” that indigenous microorganisms in soil and groundwater can use sulfate and trivalent iron to degrade contaminants in an anaerobic environment. *Id.*

Moreover, all challenged claims are method claims, each of which requires the single step of “introducing persulfate and one or more trivalent metals into the environmental medium.” The Specification of the '245 patent discloses how the remedial materials are introduced. Ex. 1001, 4:47–55. The Specification also explains the chemical oxidation and biological attenuation processes. *Id.* at 3:18–7:9.

Under the totality of the circumstances, and based on the current record, we are not persuaded that, more likely than not, Petitioner would

prevail in the enablement challenge. As a result, we deny Petitioner's challenge of claims 1–26 on the enablement ground.

*The Obviousness Grounds*

Petitioner argues that (1) claims 1–6, 8, 9, 12, 13, 15, 18, and 19 would have been obvious over Valenti; (2) claims 10 and 20–22 would have been obvious over Valenti and Kennedy; (3) claims 11 and 16 would have been obvious over Valenti and the '152 patent; (4) claims 17 and 23–26 would have been obvious over Valenti and Peroxygen Talk 2010; and (5) claim 14 would have been obvious over Valenti and Walling. Pet. 41–75. Based on the current record, we determine Petitioner has not established that, more likely than not, it would prevail in any of these assertions.

Each challenged claim requires, either directly or through dependency, that the “amount of the one or more trivalent metals is between approximately 17–30% of molecular weight of the persulfate.” Ex. 1001, 7:14–21, 8:11–20. In all obviousness challenges, Petitioner relies on Valenti for teaching this limitation. Pet. 44–45. Specifically, Petitioner contends that Valenti “describes a ratio between mass of introduced zero-valent iron and mass of introduced sodium persulfate, that is within the identical ratio range” claimed (i.e., 17–30%). *Id.* at 44.

Petitioner argues that Valenti teaches “well known Fenton's oxidation reactions between  $\text{H}_2\text{O}_2$  and ZVI produced trivalent iron (a.k.a., ferric iron,  $\text{Fe}^{3+}$ ) and hydroxyl free radicals in-situ.” *Id.* at 48 (citing Ex. 1004, 1–2). Petitioner asserts that in Valenti, “the mass of ZVI [zero-valent iron] introduced (500 kg), to generate the trivalent iron with Fenton's oxidation

reactions, was 16.42% of the mass of molecules of sodium persulfate introduced (3,045.5 kg).” *Id.* at 51 (citing Ex. 1004, 3). Petitioner then refers to the prosecution history, where the applicant equated “17.65 – 29.41g of  $\text{Fe}^{3+}$  per 100g of  $\text{Na}_2\text{S}_2\text{O}_8$ ” to “approximately 17–30%.” *Id.* at 18 (citing Ex. 1002, 31). According to Petitioner, “[g]iven the Patent Owner’s interpretation of ‘approximately 17%’ included ‘17.65%’, a POSA would understand the claimed ‘approximately 17%’ to read on the 16.42% disclosed in” Valenti. *Id.* at 51.

Petitioner’s argument is premised on its proposed claim construction of the term “molecular weight of the persulfate.” Petitioner contends that even though the term “molecular weight of the persulfate” could mean “the mass of one molecule of persulfate introduced,” it should be construed to mean “the mass of molecules of persulfate introduced.” Pet. 20–21. For purposes of this Decision, we do not need to resolve this issue because under either construction, we are not persuaded that Valenti teaches the recited ratio.

Indeed, if the term “molecular weight of the persulfate” means “the mass of one molecule of persulfate introduced,” the amount of the trivalent metal generated by reacting 500 kg of zero-valent iron with 1,028.5 liter of  $\text{H}_2\text{O}_2$  (Ex. 1004, 3) cannot possibly be approximately 17–30% of the weight of a single persulfate molecule.

Next, we assume the term means, as Petitioner proposes, “the mass of molecules of persulfate introduced.” *See* Pet. 22. To meet the claimed ratio under this assumption, the mass of the trivalent metal introduced should be

approximately 17–30% of the mass of the persulfate introduced. Valenti, however, teaches the mass of zero-valent iron—not trivalent iron—is 16.42% of the mass of sodium persulfate introduced. Ex. 1004, 3. Petitioner is correct that Valenti also teaches introducing hydrogen peroxide, which could convert zero-valent iron to trivalent iron. *Id.*; Ex. 1001, 3:65–4:4 (disclosing zero-valent iron as a source of trivalent iron). Hydrogen peroxide, however, also converts zero-valent iron to divalent iron. *See* Ex. 1008, 3. Even though divalent iron can further react with hydrogen peroxide to form trivalent iron (*see* Ex. 1011, 125), Petitioner does not point to credible evidence or otherwise persuade us that the entire amount of zero-valent iron introduced in Valenti (500 kg) would be converted to trivalent iron. Thus, even accepting, for purposes of this Decision, Petitioner’s contention that the 16.42% ratio between zero-valent iron and persulfate is “approximately 17%” (*see* Pet. 51), we would not be persuaded that the amount of trivalent iron generated therein, which the current record suggests likely would be less than the amount of zero-valent iron, is also “approximately 17%” of the persulfate.

In sum, Petitioner does not persuade us that it would, more likely than not, prevail in showing that Valenti, alone or in combination with other asserted prior art, renders the challenged claims obvious. As a result, we deny Petitioner’s challenge of claims 1–26 on the obviousness grounds.

*The Patent-Ineligible-Subject-Matter Ground*

Petitioner argues that claims 1–26 are unpatentable under 35 U.S.C. § 101 because they are directed to patent-ineligible subject matter. Pet. 75–

80. Based on the current record, we determine Petitioner has not established that, more likely than not, it would prevail in this assertion.

According to Petitioner, the challenged claims “are method claims and recite only a single step—‘introducing persulfate and one or more trivalent metals into an environmental medium’—which was conventional activity . . . and the remaining elements merely recite the theoretical natural phenomena.” *Id.* at 75. Even assuming the chemical oxidation and biological attention recited in the claims are, as Petitioner characterizes, “natural phenomena,” a process is not unpatentable simply because it recites natural phenomena. *See Diamond v. Diehr*, 450 U.S. 175, 187 (1981); *see also Mayo Collaborative Servs. v. Prometheus Labs.*, 132 S. Ct. 1289, 1297 (2012) (stating that the steps of administering a drug to a patient and determining the resultant level of a metabolite in the patient “are not themselves natural laws”). Instead, applications of such phenomena to a new and useful end remain eligible for patent protection. *Diehr*, 450 U.S. at 187.

Here, each challenged claim recites chemical and biological reactions that, according to Petitioner, “may occur naturally.” Pet. 75. Each claim as a whole, however, is directed a method of practically combining the reactions to remove soil and groundwater contaminants. The method employs the reactions; but it does not preempt the use of the reactions. *See Diehr*, 450 U.S. at 187. Indeed, the claim not only recites the step of introducing persulfate and trivalent metals into the contaminated medium, but also requires a specific ratio (17–30%) between the trivalent metals and

persulfate “so that at conclusion of the chemical oxidation sufficient residual sulfate and sufficient residual trivalent metals remain . . . to promote the biological attenuation process.” Ex. 1001, 7:14–28, 8:11–25. As such, no challenged claim as a whole is directed to any natural phenomena.

In sum, Petitioner does not persuade us that it would, more likely than not, prevail in showing that the challenged claims are directed to patent-ineligible subject matter. As a result, we deny Petitioner’s challenge of claims 1–26 on this ground.

### CONCLUSION

For the foregoing reasons, the information presented in the Petition and accompanying evidence establishes that it is more likely than not that claims 1–26 of the ’245 patent are unpatentable.

At this stage of the proceeding, the Board has not made a final determination as to the patentability of claims 1–26 or the construction of any claim term.

### ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 324(a), a post-grant review is hereby instituted to determine whether claims 1–26 of the ’245 patent are unpatentable under 35 U.S.C. § 112(a) for lack of adequate written-description support;

FURTHER ORDERED that no other grounds raised in the Petition are instituted;

FURTHER ORDERED that pursuant to 35 U.S.C. § 324(d) and

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37 C.F.R. § 42.4, notice is hereby given of the institution of a trial commencing on the entry date of this decision.

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