

Paper No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE SHERWIN-WILLIAMS COMPANY,
Petitioner,

v.

ARCH CHEMICALS, INC.,
Patent Owner

Patent No. 9,723,842

Issued: August 8, 2017

Filed: May 24, 2007

Inventors: Nicholas Edward Thompson, Malcolm Greenhalgh, Fitzgerald Clark

Title: Isothiazoline Biocides Enhanced By Zinc Ions

Inter Partes Review No. 2019-01498

CORRECTED
PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,723,842

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PETITIONER’S EXHIBIT LIST

Exhibit	Exhibit Number
U.S. Patent No. 9,723,842 to Thompson et al. (filed May 24, 2007) (the “’842 Patent”)	1101
USPTO File History of the U.S. Patent No. 9,723,842 (filed May 24, 2007) (the “’842 Patent File History”)	1102
U.S. Published Patent Application No. US 2007/0224135 A1 to Liu et al. (filed March 24, 2006) (“Liu”)	1103
Excerpts of John J. Florio et al., ed., Handbook of Coatings Additives, (2d ed. 2002), including chapter titled “Biocides: Wet State and Dry Film” authored by Paul S. Kappock (“Handbook”)	1104
U.S. Patent No. 9,731,321 to Hawckett et al. (filed Oct. 4, 2005) (“Hawckett”)	1105
European Patent No. EP 07 03726 B1 to Payne (filed May 27, 1994) (“Payne”)	1106
U.S. Published Patent Application No. US 2003/0232906 A1 to Ghosh (filed June 4, 2003) (“Ghosh”)	1107
U.S. Patent No. 5,073,582 to LeSota (filed July 11, 1989) (“LeSota ’582”)	1108
U.S. Patent No. 5,208,272 to LeSota (filed Oct. 12, 1990) (“LeSota ’272”)	1109
U.S. Patent No. 5,227,156 to Wiese (filed April 14, 1992) (“Wiese”)	1110
I. Victor Mattei et al., <i>Formulating Stable Latex Paints With Zinc Oxide</i> , 63 J. of Coatings Tech. No. 803, Dec. 1991, at 39-45 (“Mattei”)	1111
Excerpts of Harvey E. Brown, Zinc Oxide Properties and Applications (1976) (“Brown”)	1112
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Plaintiff Arch Chemicals, Inc.’s Initial Claim Chart in <i>Arch Chemicals, Inc. v. The Sherwin-Williams Company</i> , Case No. 18-2037-LPS (D. Del. Aug. 9, 2019) (filed under seal)	1120

I. PRELIMINARY STATEMENT

Petitioner The Sherwin-Williams Company (“Petitioner”) requests *Inter Partes* Review (“IPR”) of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 17, 18, 20, 21, 24, 25, 26, 27, 28, 31, 32, 33, 36, 37, and 38 (the “Challenged Claims”) of U.S. Patent No. 9,723,842 to Thompson et al., entitled “Isothiazoline Biocides Enhanced by Zinc Ions” (“the ’842 Patent”) (Ex. 1101), assigned to Arch Chemicals, Inc. (“Patent Owner”).

II. INTRODUCTION

The ’842 Patent claims antimicrobial compositions for use in a functional fluid comprising one of two species of known biocides—*isothiazoline-3-one* (1,2-benzisothiazoline-3-one (“BIT”) or N-(n-butyl)-1,2-benzisothiazoline-3-one (“BBIT”) and combinations thereof)—together with known species of a zinc compound—zinc oxide, zinc chloride, or combinations thereof). The Challenged Claims recite that each component is present in the antimicrobial composition in specific concentrations, and a claimed ratio between the two components (the “concentration ratio”) within a particular range.

However, these claimed antimicrobial compositions were already known and obvious to one of skill in the art. Properly construed, the claimed concentration limitations are measured in an antimicrobial composition, and not in a functional fluid (e.g., a paint) to which the antimicrobial composition is added.

Applying this proper construction, prior art reference Liu disclosed prior to the '842 Patent invention, an antimicrobial composition concentrate comprising BIT and zinc oxide which, upon dilution by a POSITA by a factor of 400x, yielded the antimicrobial composition of the Challenged Claims.

Two years prior to the invention, Patent Owner's own employee authored a book chapter titled "Biocides: Wet State and Dry Film" in the Handbook of Coatings Additives ("Handbook") recommending that zinc pyrithione be added as an antimicrobial component. This chapter, in combination with the diluted antimicrobial concentrates of Liu, renders obvious all Challenged Claims.

Even if the claimed concentration limitations were improperly construed to measure concentration in a functional fluid (e.g., a paint), then Handbook renders the patent claims obvious. In Handbook, Patent Owner's own employee taught that BIT should be added as a wet-state preservative, and recommended a concentration that is nearly identical to the '842 Patent's claimed range. He further taught in Handbook that zinc pyrithione (a pyrithione salt) should be added and recommended a concentration, and that if zinc pyrithione is added, 0.05% percent zinc oxide be added to prevent discoloration. Use of the zinc pyrithione with zinc oxide as taught in Handbook at the amount recommended in Handbook is nearly identical to the zinc oxide concentration range in the '842 Patent claims. Thus, when BIT is added at the concentration taught in Handbook, and zinc pyrithione is

added at the concentration taught in Handbook (together with the recommended concentration of zinc oxide), the result is the composition claimed in the '842 Patent.

Even point of alleged novelty of the '842 Patent was known. The '842 Patent asserts that the zinc compound enhances the antimicrobial activity of the isothiazoline-3-one compound. Ex. 1101 2:66-3:7. However as detailed herein, it was known that zinc oxide has a synergistic and stabilizing effect on BIT. Patent Owner's declarations submitted during prosecution of the '842 Patent to overcome an obviousness rejection showed only a known and expected synergy between BIT and zinc compounds; and in any case, did not support the full scope as required.

Each of the Challenged Claims was disclosed in the prior art, and as explained herein, is anticipated or rendered obvious under 35 U.S.C. §§ 102 and 103. Accordingly, *inter partes* review should be instituted.

III. IDENTIFICATION OF CHALLENGED CLAIMS AND GROUNDS THEREFOR

Ground 1: Claims 1, 2, 3, 6, 7, 8, 10, 13, and 15 are invalid as obvious under § 103 in light of U.S. Published Patent Application US 2007/0224135 to Liu et al. and the knowledge of a Person Having Ordinary Skill in the Art ("POSITA").

Ground 2: Claims 4, 5, 9, 12, 17, 18, 20, 21, 24, 25, 26, 27, 28, 31, 32, 33, 36, 37, and 38 are invalid as obvious under § 103 in light of Liu, Handbook, and the knowledge of a POSITA.

Ground 3: All Challenged Claims of the '842 Patent are invalid as obvious under 35 U.S.C. § 103 in light of Handbook and the knowledge of a POSITA.

IV. BACKGROUND

A. The Alleged Invention of the '842 Patent

The '842 Patent issued on August 8, 2017, from application no. 11/805,779, filed on May 24, 2007. The '842 Patent claims priority under § 119 to provisional application No. 60/808,697, filed May 26, 2006. For purposes of this Petition only, it will be assumed that the alleged priority date for the '842 patent is May 26, 2006.

The '842 Patent claims *antimicrobial compositions* comprising identified species of isothiazoline-3-one and identified species of zinc compound. Ex. 1101 cl. 1, 3, 6, 7. The isothiazoline-3-one species are 1,2-benzisothiazolin-3-one ("BIT") and N-(n-butyl)-1,2-benzisothiazoline-3-one ("BBIT"). The zinc compound species are zinc oxide and zinc chloride. The '842 Patent does not claim merely the presence of BIT or BBIT and zinc chloride or zinc oxide: each must be present in the composition within a specific concentration range, and also present in concentrations relative to each other within a particular concentration ratio range. The '842 Patent also claims the addition of a pyrithione compound as a co-biocide.

B. State of the Art Prior to the Alleged Invention

The The'842 Patent's purported improvement was that antimicrobial

compositions containing an isothiazoline-3-one compound and a zinc compound had enhanced efficacy in inhibiting microbial growth. Ex. 1101 at 2:66-3:7. These compounds were well-known antimicrobials used in antimicrobial compositions and finished products both individually and together within the concentration and concentration ranges claimed in the Challenged Claims.

1. Known use of BIT and zinc oxide

The '842 Patent admitted that "Isothiazolines, such as BIT are known to be effective antimicrobials." Ex. 1101 at 1:16-20. The '842 Patent identifies a European Patent, the European Patent EP 07 03726 B1 filed in May 1994 (the "Payne Patent"), which identified BIT to have been "used as a bactericide in a variety of applications." Ex. 1101 at 1:17-18; Ex. 1106. In Handbook, Patent Owner's employee taught the use of BIT as a wet-state preservative and recommended a target concentration. Ex. 1104 at 274, 275, 287.

Likewise, the '842 Patent admits that the use of a zinc compound with an isothiazoline-3-one compound as an antimicrobial in compositions was well-known. Ex. 1101 at 1:21-29. The '842 Patent identified a British published Patent Application GB 2,230,190 ("Morpeth"), filed in 1989, that taught the use of BIT and a zinc compound, namely zinc chloride, in a composition that met the claimed concentration ranges. Ex. 1118 at 14:9-11, 14:25. Morpeth is Grounds 1 and 2 in Petitioner's concurrently-filed Petition for *Inter Partes Review* in

IPR2019-01497. Prior to the earliest claimed priority date, Liu taught an antimicrobial concentration containing BIT and zinc oxide. Upon dilution upon instructed by Liu, the result is the '842 Patent claims. Liu is Ground 1 and, in combination with Handbook as disclosing zinc pyrithione, Ground 2 of this Petition for *Inter Partes Review*.

2. Known use of zinc pyrithione as a co-biocide

The use of a co-biocide of pyrithione was well known in the art well before the '842 Patent's earliest claimed priority date. The admitted prior art in the '842 Patent, Payne, taught the use of an additional microbiological agent, i.e. co-biocide, with BIT, namely 2-mercaptopyrithione-1-oxide. Ex. 1106 (European Patent 0703726 ("Payne")) at 3:55-56. Payne further taught the use of the Zinc complex of 2-mercaptopyrithione-1-oxide, which is zinc pyrithione. *Id.* Thus, Payne, issued over 12 years before the earliest claimed priority date, taught the use with BIT of a zinc pyrithione co-biocide.

In Handbook, authored two years prior to the '842 Patent's earliest alleged priority date, Patent Owner's employee taught that zinc pyrithione may be added to antimicrobial compositions within the claimed ranges of the Challenged Claims. Ex. 1104 at 279-280. When zinc pyrithione is used in a paint composition, Patent Owner's employee recommended that zinc oxide should be included with the zinc pyrithione due to the tendency of zinc pyrithione to chelate (complex) with iron

and discolor the composition. *Id.* at 280. Patent Owner's employee provided a recommended concentration of zinc oxide that should be added that was within the claimed ranges of the Challenged Claims. *Id.* at 280.

Further, Patent Owner's employee also taught that isothiazoline-3-one compounds, including BIT, may be used in antimicrobial compositions, *id.* at 275, and that BIT should be used in a concentration that overlaps with the Challenged Claims' concentration range. Handbook at 287. Following Patent Owner's own recommendations, including BIT at the recommended concentration, zinc pyrithione at the recommended concentration, and the recommended amount of zinc oxide, the result is the Challenged Claims.

C. The Prosecution of the '842 Patent, Narrowing of Claims, and Reliance on Alleged "Unexpected Results" Showing a Synergistic Effect Between BIT and Zinc Oxide

Patent Owner's claims during prosecution were the subject of 15 office actions, three advisory actions, and seven Requests for Continued Examination. Substantial claim narrowing occurred during the patent prosecution, which spanned nearly 10 years from first rejection to allowance. Ex. 1102.

During prosecution, the examiner rejected Patent Owner's claims as obvious in light of prior art showing that compositions containing BIT within the concentration range of the Challenged Claims and zinc oxide within the concentration range of the Challenged Claims. Ex. 1102 at 640-642. To overcome

this rejection, Patent Owner submitted declarations of experimental results that Patent Owner contended showed “unexpected results”: increased BIT effectiveness when used in combination with zinc oxide or zinc chloride, as compared to BIT alone. Patent Owner stated that these “unexpected results can be indicative of synergism between 1,2-benzisothiazoline-3-one [BIT] and zinc oxide.” Ex. 1102 at 668. This claim of purportedly novel synergistic results between zinc oxide and BIT remains the purported point of novelty.

D. The Synergistic Effect Between BIT and Zinc Compounds, Including Zinc Oxide, Was Known

The synergistic effect claimed as inventive by Patent Owner was known. U.S. Patent No. 5,208,272 (“LeSota”), which issued in 1993, taught that “[i]n aqueous paint formulations, zinc oxide is a well known stabilizer for isothiazolones [the common name for isothiazoline-3-one compounds].” Ex. 1109 at 1:17-19. Moreover, LeSota taught that “zinc oxide also acts as a synergist with the isothiazolones for mildew resistance in aqueous paint formulations.” *Id.* at 1:19-21. Other publications disclosed the synergy between zinc compounds and isothiazoline-3-ones. For instance, Ghosh stated, “The use of various copper and zinc salts as stabilizers for isothiazolones in paint compositions is disclosed in U.S. Pat. Nos. 5,073,582 and 5,208,272. Typically, copper salts are not required as stabilizers for isothiazolones when the paint compositions contain zinc oxide.” Ex. 1107 at ¶3. Mattei stated in 1991, “[i]n its own right, zinc oxide . . . functions

synergistically with isothiazoline microbiocides.” Ex. 1111 at 39; see also 1110 at 1:26-30. And Brown stated, thirty years before the earliest claimed priority date of the ’842 Patent, “In a study of shelf-preservation of latex paints, Carter, et al., reported that mold formation was inhibited by mixtures of ZnO with 1,2-benzisothiazolin-3-one”). Ex. 1112 at 79.

Thus, contrary to Patent Owner’s experimental results declarations submitted during prosecution, it was known for *30 years* before the ’842 Patent’s earliest claimed priority date that there was synergistic effect of increased antimicrobial efficacy when a zinc compound (and specifically zinc oxide) was used with isothiazoline-3-one compounds. Ex. 1113 at ¶¶44-46.

V. PERSON OF ORDINARY SKILL IN THE ART

A person having ordinary skill in the art would have at least an associates degree in Chemistry, Biochemistry, or a related field, with 5-7 years of experience in coatings or biocide formulation. Higher degrees or higher degrees that are more specific to polymers and coatings need less work experience. Ex. 1113 ¶¶47-50.

A POSITA also would be able to perform routine experimentation for formulations, including mixing concentrates and diluting them, calculating concentrations and required amounts to yield a target concentration in a final product. Ex. 1113 ¶¶51-52.

VI. CLAIM CONSTRUCTION

The '842 Patent claims are construed according to the same principles that apply in a civil action under 35 U.S.C. § 282(b). 83 Fed. Reg. 51340, Final Rule (Oct. 11, 2018). The rule from *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) applies to this proceeding. *Id.* Under *Phillips*, “claim terms are generally given their plain and ordinary meanings to one of skill in the art when read in the context of the specification and prosecution history; the only exceptions to this general rule are when the patentee acts as his own lexicographer or when he disavows claim scope.” *TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1328 (Fed. Cir. 2015)

A. Context of the '842 Patent

The '842 Patent claims two categories of substances: an “antimicrobial composition” (cl. 1, 7) and a “functional fluid comprising . . . a wet state preservative comprising an antimicrobial composition,” (cl. 3, 6). Claims 1 and 7 claim an “antimicrobial composition” that “comprises an isothiazoline-3-one selected from the group of [BIT] and [BBIT] and combinations thereof” that is “present in an amount from 1 to 500 ppm”; and a “zinc compound comprising zinc chloride, zinc oxide, or combinations thereof” that is “present in an amount of 5 to 200,000 ppm.” The “weight ratio of the isothiazoline-3-one to the zinc compound is from 1:100 to 100:1.”

The “functional fluid” of claim 3 comprises a “wet state preservative comprising [the antimicrobial composition of claim 1].” Claim 6 covers a species of “functional fluid,” a “coating composition.” Ex. 1101 at 3:52-55 (“The antimicrobial compositions of the present invention are suitably used in functional fluids such as polymer emulsions, or other coating compositions . . .”). In claim 6, the “coating composition . . . compris[es] . . . a wet state preservative comprising [the antimicrobial composition of claim 1].” In each of claims 1, 3, 6, and 7, the concentration elements cover the antimicrobial composition, not the functional fluid.

The ’842 Patent specification states that the “antimicrobial composition of the present invention is suitably incorporated into a functional fluid.” Ex. 1101 at 3:8-9. The specification, like the claims, teaches only one single set of concentration limitations that cover the antimicrobial composition. The Summary of the Invention states: “In one aspect, the present invention relates to an antimicrobial composition . . . “[*i*]n the composition, the isothiazoline-3-one is present in an amount of 1 to 500 ppm (preferably 5 to 500 ppm).” Ex. 1101 at 1:43-56; *also* 3:30-35. (emphasis added). The zinc compound is present “[*i*]n the composition . . . in an amount of 5 to 200,000 ppm (preferably 5 to 500 ppm). *Id.* 1:43-56 (emphasis added). This range is claimed in the “antimicrobial composition” of claims 1 and 7, and in the “antimicrobial composition” element of claims 3 and 6.

In all of these claims, the concentration elements cover the “antimicrobial composition.” The specification also states that “[a]ll percentages given herein are weight percents *based on the total weight of the composition* unless otherwise stated.” Ex. 1101 at 8:66-9:1 (emphasis added). In referring to the “total weight of the composition,” Patent Owner referred to the “antimicrobial composition of the present invention.” Ex. 1101 at 1:43-60 (Summary of the Invention).

B. Patent Owner’s Different Interpretation for Infringement

In Patent Owner’s concurrent district court patent infringement action, Patent Owner provided “Plaintiff Arch Chemicals, Inc.’s Initial Claim Chart.” Patent Owner’s claim chart demonstrates how Patent Owner is construing the claims in the ’842 Patent. *Wilson Sporting Goods Co. v. Hillerich & Bradsby Co.*, 442 F.3d 1322, 1326-27 (Fed. Cir. 2006).

Patent Owner’s claim chart illuminates the key import of the claim construction dispute here: Patent Owner reads all Challenged Claims on a functional fluid or coating composition—in this case, Petitioner’s paints. Patent Owner does not read the claim on an antimicrobial composition that “is suitably incorporated into a functional fluid” as required by the ’842 Patent. Ex. 1101 at 3:8-9. Rather, Patent Owner reads the “antimicrobial composition” of claims 1 and 7 and the “functional fluid” and “coating composition” of claims 3 and 6 that comprise an “antimicrobial composition” on the *same substance*. *E.g.*, Ex. 1120 at

1-3, 9-11. Likewise, Patent Owner reads the concentration limitations as covering the functional fluid (*e.g.*, a paint); not the antimicrobial composition that “is suitably incorporated into a functional fluid” as required by the ‘842 Patent. *Id. contra* Ex. 1101 at 3:8-9. Patent Owner’s interpretation is contrary to the limitations in the claims and the specification, and its attempt to ignore the patent’s clear distinction between an “antimicrobial composition” and a “functional fluid” is clearly improper. Ex. 1101 at 1:43-60 (Summary of the Invention), 3:8-9, 3:52-53.

C. Preambles of Claims 1, 3, 6, and 7 Are Limiting

The preambles of the independent Challenged Claims are limiting because they are “necessary to give life, meaning, and vitality to the claim.” *See Eaton Corp. v. Rockwell Int’l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003). The structure of the Challenged Claims demonstrates that the “antimicrobial composition” is distinct from the “functional fluid. Claims 1 and 7 are directed solely at the “antimicrobial composition,” which the patent clearly describes “is suitably incorporated into a functional fluid” as required by the ‘842 Patent. Ex. 1101 at 3:8-9.

The preambles of claims 3 and 6 require a “functional fluid” or “coating composition” which are distinct from the “antimicrobial composition” required in subsequent claim elements. The preambles breathe life into the claims in

distinguishing between the antimicrobial composition and the functional fluid into which an antimicrobial composition is incorporated. As such, the preambles are limiting in that “functional fluid” and “coating composition” are distinct from the “antimicrobial composition.”

The specification provides further support that these are distinct categories of substances. The specification states “[t]he antimicrobial composition of the present invention is suitably incorporated into a functional fluid.” Ex. 1101 3:8-9; *see also id.* 3:52-54. These are unequivocal statements that an antimicrobial composition and a functional fluid are different. Indeed, the specification does not contain any statement to the contrary. Rather, the Summary of the Invention states: “In one aspect, the present invention relates to an antimicrobial composition,” and then provides that “[i]n the composition,” the concentrations are as claimed in the antimicrobial compositions of claims 1, 3, 6, and 7. As such, the Board should find that the preambles are limiting to clarify that the “antimicrobial composition” is distinct from the “functional fluid” and the “coating composition.” Ex. 1113 ¶¶62-67.

D. “Present in an Amount Of”

This term should be construed as “present in an amount of the antimicrobial composition.” Ex. 1113 ¶¶68-73. Independent claims 1, 3, 6, and 7 each include concentration ranges for isothiazoline-3-one and zinc compound components. In

claims 1 and 7, it is clear that the parts per million (ppm) concentration range is concentration *in the antimicrobial composition*, as this is the only composition referenced in the claims. Claims 3 and 7 contain the same antimicrobial composition. The concentration elements of claims 3 and 7 are the same as in claims and 7. In claims 3 and 7, this same antimicrobial composition is included in, but distinct from, a “functional fluid” or a “coating composition.” Nevertheless, the only proper interpretation is that these ranges in claims 3 and 6 are in the antimicrobial composition, consistent with the interpretation of claims 1 and 7 that include identical limitations.

The specification requires this construction. The Summary of the Invention first states that “present invention relates to an antimicrobial composition,” and then states that “[i]n the composition,” the components are present in the same concentration ranges claimed in all of the independent Challenged Claims. Ex. 1101 at 1:43-60. This leaves no room for concentrations to be measured in a functional fluid. Indeed, the specification lacks any disclosure of concentration ranges in a functional fluid (e.g., a paint). Rather, the disclosures demonstrate that the concentrate ranges refer to the antimicrobial composition.

The specification and claims demand that the term “present in an amount of” means “present in the antimicrobial composition in an amount of.” Ex. 1113 ¶¶68-73.

E. “Consisting of” and “Optionally”

The terms “consisting of” and “optionally” appear in ’842 Patent claim 17. As to the term “consisting of,” this term closes the claim to the presence of other elements. The phrase “consisting of” signifies “close[ing] the claim to the inclusion of materials other than those recited except for impurities ordinarily associated therewith.” *Conoco, Inc. v. Energy & Envtl. Int’l, L.C.*, 460 F.3d 1349, 1360 (Fed. Cir. 2006) Thus, in claim 17, the “antimicrobial composition” can contain no other components other than the four substances recited in the claims.

As to the term “optionally,” “optional elements do not narrow the claim because they can always be omitted.” *In re Johnston*, 435 F.3d 1381, 1384 (Fed. Cir. 2006). Accordingly, to a POSITA, the term “optionally” in claim 17 does not require that the “at least one polymer base medium” and “a co-biocide.” Ex. 1113 ¶¶74-76.

VII. STATEMENT OF PRECISE RELIEF REQUESTED FOR EACH CLAIM CHALLENGED

Petitioner requests review under 35 U.S.C. § 311 of the Challenged Claims and cancellation of these claims as unpatentable under 35 U.S.C. §§ 102 and/or 103 for the following reasons:

Ground	Proposed Statutory Rejections for the ’842 Patent	Exhibit Nos.
1	Claims 1, 2, 3, 6, 7, 8, 10, 13, and 15 are invalid under § 103 as obvious in view of Liu and the knowledge of a POSITA	1103

2	Claims 4, 5, 9, 12, 17, 18, 20, 21, 24, 25, 26, 27, 28, 31, 32, 33, 36, 37, and 38 are invalid under § 103 as obvious in light of Liu, Handbook, and the knowledge of a POSITA	1103, 1104
3	Alternatively, if the claims are construed to cover concentrations in a functional fluid, then claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 17, 18, 20, 21, 24, 25, 26, 27, 28, 31, 32, 33, 36, 37, and 38 are invalid under § 103 as obvious in light of Handbook and the knowledge of a POSITA.	1104

VIII. RELEVANT LEGAL STANDARDS FOR ANTICIPATION AND OBVIOUSNESS OF CONCENTRATION RANGE CLAIMS AND MARKUSH GROUPS

Petitioner here does not restate all pertinent standards of the law or anticipation or obviousness. Instead, Petition will only reference legal standards applicable specifically to the claims at issue, each of which includes elements recited as a concentration range.

A. Standards for Anticipation for Claims Covering Multiple Compositions

“It is . . . an elementary principle of patent law that when, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is ‘anticipated’ if one of them is in the prior art.” *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 782 (Fed. Cir. 1985) (Rich, J.); *Brown v. 3M*, 265 F.3d 1349, 1351 (Fed. Cir. 2001) (“When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior

art.”). As applied to a concentration range, when the prior art discloses a particular composition falling within the claimed range, the claim is anticipated. *Id.*

(reversing allowance of patent claims because prior art article disclosed an alloy with component concentrations within the claimed ranges).

Several Challenged Claims include Markush elements. When an element is written in Markush form, then “the entire element is disclosed by the prior art if one alternative in the Markush group is in the prior art.” *Fresenius USA, Inc. v. Baxter Int’l, Inc.*, 582 F.3d 1288, 1298 (Fed. Cir. 2009)

B. Standards of Obviousness for Composition Claims that Include Claim Elements Covering a Range

A *prima facie* case of obviousness is present for composition claims where there is “structural similarity between claimed and prior art subject matter, proved by combining references or otherwise, where the prior art gives reason or motivation to make the claimed compositions.” *In re Dillon*, 919 F.2d 688, 692 (Fed. Cir. 1990) (*en banc*).

When a claims cover a range and the prior art discloses a different but overlapping range, the Federal Circuit has “consistently held that even a slight overlap in range establishes a *prima facie* case of obviousness.” *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (citing *In re Woodruff*, 919 F.2d 1575, 1578 (C.C.P.A. 1976); *In re Malagari*, 499 F.2d 1297, 1303 (C.C.P.A 1974); *Genetics Inst., LLC v. Novartis Vaccines & Diagnostics, Inc.*, 655 F.3d 1291, 1313 (Fed.

Cir. 2011) (“[E]ven a slight overlap in range establishes a *prima facie* case of obviousness.”).

A *prima facie* case of obviousness exists even when the claimed range and the prior art range do not overlap, but “are close enough such that one skilled in the art would have expected them to have the same properties.” *In re Peterson*, 315 F.3d at 1329 (Fed. Cir. 2003) (citing *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783, (Fed. Cir. 1985)). When *prime facie* obviousness is present due to overlap or closeness of a prior art range, then the claim is obvious absent evidence that the claimed range is critical because the claimed range has, to a POSITA, some surprising and unexpected property. *In re Geisler*, 116 F.3d 1465, 1469-70 (Fed. Cir. 1997); *Dillon*, 919 F.2d at 692-93.

IX. INTRODUCTION TO PRIOR ART

A. Liu

Liu was filed on March 24, 2006 and published on Sept. 27, 2007. Thus, Liu is at least prior art under pre-AIA 35 U.S.C. § 102(e)(1).¹ Liu is not cited on the face of the ’842 Patent.

¹ Because the ’842 Patent was filed on May 24, 2007, pre-AIA section 102 and 103 apply. Manual of Patent Examining Procedure, § 2159.01.

Liu taught an aqueous suspension concentrate that includes a UV-labile biocide activity for delivery of such concentrate into formulations. Ex. 1103 at ¶0007. Liu taught that the biocide may be an isothiazolone, such as benzisothiazolone (BIT). *Id.* ¶0011. In addition, Liu taught that the concentrate may include a UV-blocker, such as zinc oxide. *Id.* ¶0012. Liu disclosed that a concentrate with the biocide, such as BIT, and UV-blocker, such as zinc oxide, was preferred in order for such concentrate to “experience substantially no degradation or coloration upon storage and/or exposure to sunlight or UV-radiation *while retaining its bioactivity.*” *Id.* ¶0008 (emphasis added).

Liu then disclosed that the concentrate should include a concentration of the biocide, such as BIT, in a range by weight of the prepared concentrate of 5-50%, and preferred range of 10-40%. *Id.* ¶0048. Likewise, Liu disclosed that the concentration of the UV-blocker, such as zinc oxide, should be included in the concentrate in a range by weight of the prepared concentrate of 0.2%-20%, and preferred range of 2-10%. *Id.* Thus, Liu disclosed various examples of antimicrobial composition concentrates that include a biocide, including BIT, and the UV-blocker, including zinc oxide, within the preferred ranges that Liu disclosed. *Id.* ¶¶0051-61.

Liu taught that “[t]he concentrate is easily dilutable with water.” *Id.* at ¶25. Liu also taught how to dilute the antimicrobial concentrate: the “composition may

be diluted with a desired amount of water by mixing in a high speed mixer for a period of from about 30 minutes to 1 hour. *Id.* at ¶0031. The antimicrobial composition concentrates of Liu should be diluted so that “[o]n dilution, the active component can have a concentration of 10 ppm to 50% in the diluted mixture while retaining suspension stability for 4 hours or more.” *Id.*

Liu thus taught a POSITA to dilute the antimicrobial composition concentrate by a factor that would result in the claimed concentration ranges of the ’842 Patent. One dilution factor that would result in the claims is dilution by 400x, but other dilution factors would also result in the claimed concentration ranges.

Liu also taught that the diluted concentrate could be incorporated into a finished product like a paint or coating composition, Ex. 1103 ¶0015, each of which are functional fluids in the ’842 Patent. Ex. 1101 at 3:60-64. Such modifications would not change the principle of operation, namely, inhibiting microbial growth. *Id.* ¶0008.

B. Handbook

Handbook was publicly available and accessible in libraries in the United States as of December 2004. Ex. 1115 at ¶¶49-51. Handbook is prior art to the ’842 Patent under pre-AIA 35 U.S.C. §§ 102(a) and 102(b). Ex. 1115. Handbook was not cited during prosecution of the ’842 Patent.

Handbook discloses BIT as a wet-state preservative. Ex. 1104 at 275.

Handbook also provided a recommended concentration of BIT in a finished product. The recommended concentration was “0.1-0.3% of 20% solution.” *Id.* at 287. “0.1-0.3% of a 20% solution” of BIT is 200-600 ppm BIT, as shown in the calculation below.

$$0.1 \% \times 20\% \text{ solution} \times \frac{1}{100} (\text{conversion from percent to fraction})\% = \\ 0.0002 \times 1,000,000 (\text{conversion to ppm}) = 200 \text{ ppm}$$

$$0.3 \% \times 20\% \text{ solution} \times \frac{1}{100} (\text{conversion from percent to fraction})\% = \\ 0.0006 \times 1,000,000 (\text{conversion to ppm}) = 600 \text{ ppm}$$

Ex. 1113 at ¶¶92.

Handbook also discloses that zinc pyrithione can be added to an antimicrobial composition in such amount that the concentration in a finished product would be 0.1-0.5% for “architectural” applications, Ex. 1104 at 290, such as architectural coatings like the paint and cutting fluids to which Liu’s antimicrobial composition concentrates upon dilution were added. Ex. 1103 ¶15.

Handbook also taught that if zinc pyrithione is included, 0.05% zinc oxide should also be added in order to prevent discoloration of the composition. Ex. 1104 at 280. This equates to a zinc oxide concentration of 500 ppm:

$$0.05 \% \text{ zinc oxide} \times 1/(100 (\text{conversion to fraction from } \%)) \times 1,000,000 (\text{conversion to ppm}) = 500 \text{ ppm zinc oxide}$$

Ex. 1113 ¶¶94. Handbook thus provides reason to include zinc oxide in a composition containing zinc pyrithione. Ex. 1104 at 280; Ex. 1113 ¶¶94, 98.

X. GROUND 1: CLAIMS 1, 2, 3, 6, 7, 8, 10, 13, AND 15, ARE OBVIOUS UNDER § 103 IN VIEW OF LIU AND THE KNOWLEDGE OF A POSITA

Liu in light of the knowledge of a POSITA renders claims 1, 2, 3, 6, 7, 8, 10, 13, and 15 obvious. It was obvious to combine the knowledge of a POSITA to select the aqueous antimicrobial composition concentrate of Liu including an isothiazolin-3-one compound such as BIT and a zinc compound such as zinc oxide, and to dilute the antimicrobial composition concentrate according to Liu's teaching to obtain the claimed formulations of the '842 Patent. A POSITA would have a reasonable expectation of success for such combination as the technique of dilution was taught in Liu, and was well known, and the combination of known biocides was used in a predictable manner in antimicrobial compositions, functional fluids,

or coating compositions to achieve the predictable result of preventing microbial growth. Ex. 1113 at ¶98.

A. Claim 1 is Obvious in Light of Liu and the Knowledge of a POSITA.

1. Element 1[preamble] is obvious in light of Liu and the knowledge of a POSITA.

1[preamble]	An antimicrobial composition comprising:
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Liu disclosed a concentrate that is a “UV-labile biocide active for delivery of such active in stabilized form into formulations.” Ex. 1103 ¶0007. Liu also disclosed that the “concentrate includes a biocide which is a fungicide or preservative.” *Id.* ¶0010. A biocide and/or fungicide are antimicrobials that inhibit the growth of or destroy living microorganisms, such as bacteria and fungi. Ex. 1113 ¶100; Ex. 1104 at 263. Thus, the concentrate of Liu has antimicrobial properties. Diluting the disclosed concentrate in Liu would have been known to a POSITA. Ex. 1113 ¶100. And diluting the concentrate would not change that the resulting composition is antimicrobial. *Id.* ¶100. Thus, Liu discloses or renders obvious limitation 1[preamble].

2. Limitation 1[a] is disclosed or obvious in light of Liu and the knowledge of a POSITA

1[a]	(a) at least one isothiazolin-3-one selected from the group consisting of 1,2-benzisothiazolin-3-one, N-(n-butyl)-1,2-benzisothiazolin-3-one, and combinations thereof;
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Liu disclosed that one antimicrobial that may be used in the concentrate is “Benzisothiazolone (BIT).” Ex. 1103 ¶¶0022; *see also* ¶¶0011, 0043, 0060-61. It was well known that BIT’s chemical formulation is 1,2-benzisothiazolin-3-one. Ex. 1113 ¶102; Ex. 1106 at 1:6-8. The ’842 Patent admits that the chemical name of BIT is 1,2-benzisothiazolin-3-one. Ex. 1101 at 1:14-15. As such, the concentrate disclosed in Liu discloses BIT. Upon dilution, Liu discloses or renders obvious an antimicrobial composition that comprises BIT. Ex. 1103 ¶¶0022; Ex. 1113 ¶¶102-103.

3. Limitation 1[b] is disclosed or obvious in light of Liu and the knowledge of a POSITA

1[b]	(b) at least one zinc compound comprising zinc chloride, zinc oxide, or a combination thereof;
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Liu disclosed that the concentrate may include “zinc oxide” as one of the UV-blockers. Ex. 1103 ¶¶0012. Liu also discloses example formulations of the concentrate that include zinc oxide. *Id.* at ¶¶0052. Upon dilution, the resulting antimicrobial composition would include zinc oxide, rendering obvious limitation 1[b]. Ex. 1113 ¶¶104-105.

4. Limitation 1[c] is obvious in light of Liu and the knowledge of a POSITA.

1[c]	wherein the isothiazolin-3-one is present in an amount of from 1 to 500 ppm,
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Liu disclosed an example of a concentrate that includes BIT, which is a one isothiazolin-3-one, within the range of about 1% to about 95% w/w based on the

total weight of the concentrate. Ex. 1103 ¶0060. Example 19 in Liu stated that the 1Kg concentrate is made with BIT following the procedure in Example 15C. *Id.* Example 15C is prepared following the procedures in Example 15B, except that titanium oxide replaces the zinc oxide in Example 15B. *Id.* at ¶0053. Example 15B is prepared according to Example 15A's procedure, except that 50g of zinc oxide replaces part of the 53g of remaining water in Example 15A. *Id.* at ¶0052; Ex. 1113 ¶106. Thus, the formulation disclosed in Example 19 of Liu is:

Formulation of Example 19 in Liu	
Compound	Amount (grams)
BIT	220
Easy-Sperse	25
DI Water	600
Surfynol 104 E	1
Sag 30	1
1% Keizan	122
Titanium Dioxide	50
Make-up water	3

Ex. 1103 ¶¶0051-53; 0060; Ex. 1113 ¶106.

In the above formulation, BIT would have a concentration of about 20% w/w of the total weight of the concentrate. Ex. 1113 ¶107. This equals 200,000 ppm BIT. Upon dilution by a factor of 400x water, the concentration of BIT in the resulting antimicrobial composition would be 500 ppm BIT. Ex. 1113 ¶107.

Moreover, Liu disclosed that the suitable range for the antimicrobial, such as BIT, in the concentrate would be 5-50% w/w of the total weight of the concentrate, and the preferred range was 10-40% w/w of the total weight of the concentrate. Ex. 1103 ¶0048; Ex. 1113 ¶108. In parts per million, these concentrations are 50,000 ppm – 500,000 ppm, and 100,000 ppm to 400,000 ppm. Ex. 1113 ¶108. Upon dilution by 400x, the concentration in the resulting antimicrobial composition would include 125 ppm – 1,250 ppm BIT; or 250 ppm to 1,000 ppm BIT. Ex. 1113 ¶108. These resulting concentrations are within the claimed range in Claim 1. Ex. 1113 ¶108.

As discussed above, Liu taught its concentrates should be diluted for use. Ex. 1103 ¶0031. Dilution of an aqueous concentrate by 400x is a normal factor for diluting a concentrated solution, particularly in view of Liu’s instruction to dilute. *Id.*; Ex. 1113 ¶109. Liu also taught that the resulting antimicrobial active concentration should be “10 ppm to 50% in the diluted mixture.” Ex. 1103 ¶31. Liu thus taught how to dilute its antimicrobial concentrate to concentrations within the ’842 Patent claims. Ex. 1113 ¶109.

As such, Liu discloses or renders obvious limitation 1[c]. Ex. 1113 ¶¶106-110.

5. Limitation 1[d] is obvious in light of Liu and the knowledge of a POSITA.

1[d]	wherein the zinc compound is present in an amount of from 5 to 200,000 ppm, and
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Liu disclosed in Example 19 a concentrate that include BIT. Ex. 1103 at ¶¶0060. However, Example 19 includes 50g of titanium dioxide. Ex. 1103 at ¶¶0060. It would have been obvious to a POSITA to create Example 19 substituting zinc oxide for titanium dioxide. Ex. 1113 ¶111. First, Liu disclosed two examples where zinc oxide and titanium dioxide are interchangeable with each other, Examples 15B and 15C. Ex. 1103 at ¶¶0052-53. Also, Liu disclosed that zinc oxide and titanium dioxide may be substituted for each other at the same amount, namely 50g. *Id.* Further, Liu disclosed that zinc oxide and titanium dioxide are both UV-blockers to be used in the concentrate. *Id.* at ¶0012. Thus, Liu provides explicit motivation for the substitution. One of skill would understand from the disclosures in Liu that the titanium dioxide in Example 19 could be replaced with zinc oxide at the same amount in the concentrate, such as 50g in Example 19 in Liu. Ex. 1113 ¶111.

In addition, one of skill would be motivated to use zinc oxide in Example 19 in Liu because it was known that zinc oxide is a stabilizer for isothiazolones, like BIT. Ex. 1109 1:15-18. Moreover, it was known that zinc oxide “acts as a synergist with the isothiazolones [like BIT] for mildew resistance in aqueous paint

formulations.” *Id.* at 1:19-21; *see also* Ex. 1111 pg. 39; Ex. 1112 pg. 36. The concentrate in Example 19 of Liu is a concentrate with biocide activity from BIT and is to be used in aqueous paint solutions. Ex. 1103 ¶¶0007, 0015. As such, one of skill would have been motivated to modify the composition of Example 19 to include zinc oxide because of the stabilization provided by zinc oxide and the synergistic effect in antimicrobial efficiency that zinc oxide provides to isothiazolones, like BIT. Ex. 1113 ¶112.

One of skill would have a reasonable expectation of success in substituting zinc oxide for titanium dioxide in Example 19 because it is a substitution of known components in predictable manner to achieve predictable results. As disclosed in Liu, zinc oxide and titanium dioxide were known UV-blockers. Ex. 1103 ¶0012. The use of either in the concentrate would achieve the same, predictable result of assisting in the degradation effects of sunlight and UV-radiation in the concentrate. Ex. 1113 ¶113. As disclosed in Liu, concentrates with zinc oxide and titanium dioxide, notably in the same weight percentages in each concentrate, demonstrated inhibition of degradation because of UV-light exposure. Ex. 1103 ¶¶0055-57. As such, one of skill would have had a reasonable expectation of success in the substitution of zinc oxide for titanium oxide in Example 19 in Liu because it was the substitution of known components in predictable manner to achieve predictable results. Ex. 1113 ¶113

The substitution of zinc oxide for titanium oxide in Example 19 of Liu results in the following formulation:

Formulation of Substituted Example 19 in Liu	
Compound	Amount (grams)
BIT	220
Easy-Sperse	25
DI Water	600
Surfynol 104 E	1
Sag 30	1
1% Keizan	122
Zinc Oxide	50
Make-up water	3

Ex. 1103 ¶¶0051-53; 0060; Ex. 1113 at ¶114.

In the above formulation, zinc oxide would have a concentration of about 5% w/w of the total weight of the concentrate. Ex. 1113 ¶115. In parts per million, this equates to 50,000 ppm. *Id.* Moreover, Liu disclosed that the suitable range for the UV-blocker, like zinc oxide, in the concentrate would be 0.2-20% w/w of the total weight of the concentrate, and the preferred range was 2-10% w/w of the total weight of the concentrate. Ex. 1103 ¶0048; Ex. 1113 ¶115. These concentrations equal 2,000 ppm – 200,000 ppm (0.2-20% w/w) and 20,000 ppm – 100,000 ppm (2-10% w/w). Ex. 1113 ¶115.

Upon dilution of the disclosed concentrates, the above formulation would result in an antimicrobial composition that contains 12.5 ppm zinc oxide. Ex. 1113 ¶116. The disclosed and preferred ranges would be 5 ppm – 500 ppm, and for the preferred range, 50 ppm to 250 ppm. *Id.* These ranges of zinc oxide in the resulting antimicrobial concentrate are within the claimed range in Claim 1. Ex. 1113 ¶116.

As discussed above in Section IX.A, Liu taught how to dilute its antimicrobial composition concentrates. Ex. 1103 ¶0031. The target range for the resulting antimicrobial active concentration in the composition should be “10 ppm to 50% in the diluted mixture.” *Id.* Such dilution would result in an antimicrobial composition that included zinc oxide in the claimed range. Ex. 1113 ¶117. As such, Liu renders obvious limitation 1[d]. Ex. 1113 ¶111-118.

6. Limitation 1[e] is obvious in light of Liu and the knowledge of a POSITA

1[e]	wherein the weight ratio of the isothiazolin-3-one to the zinc compound is from 1:100 to 100:1.
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As discussed above, Liu renders obvious an antimicrobial concentrate with isothiazolin-3-one and zinc compound. In addition, one of skill would be motivated and have a reasonable expectation of success of creating a concentrate as shown in Substituted Example 19 in Liu, for the reasons described above. Ex. 1113 ¶119. The formulation for the Substituted Example 19 in Liu is below:

Formulation of Substituted Example 19 in Liu	
Compound	Amount (grams)
BIT	220
Easy-Sperse	25
DI Water	600
Surfynol 104 E	1
Sag 30	1
1% Keizan	122
Zinc Oxide	50
Make-up water	3

Ex. 1103 at ¶¶0051-53; 0060; Ex. 1113 at ¶119.

In this Substituted Example 19, the isothiazolin-3-one, BIT, and the zinc compound, i.e. zinc oxide, have a weight ratio of 220g/50g, or about a 4:1 weight ratio. Ex. 1113 ¶120. Diluting the antimicrobial concentrate of Liu would not change this weight ratio. *Id.* This about 4:1 weight ratio is within the claimed ratio of 100:1 to 1:100. *Id.* As such, Liu discloses or renders obvious limitation 1[e].

Ex. 1113 ¶¶119-121

B. Claim 3 Is Obvious in Light of Liu the Knowledge of a POSITA

The '842 Patent teaches that “[t]he antimicrobial compositions of the present invention are suitably used in functional fluids such as polymer emulsions, or other coating compositions, to impart both wet state and dry state preservation.” Ex. 1101 at 3:51-54. Claim 3 covers the inclusion of the antimicrobial composition of

claim 1 with a polymer emulsion to make a functional fluid. Claim 3 is obvious.

Ex. 1113 ¶122-123.

1. Limitation 3[preamble] is obvious in light of Liu and the knowledge of a POSITA

Liu stated that its “invention herein further comprises a composition which includes the stable aqueous suspension concentrate, e.g., a paint composition; or a coating composition” Ex. 1103 ¶0015; *compare to* Ex. 1101 at 3:60-61 (stating that “[t]ypical functional fluids include coating compositions such as paints . . . and other aqueous based systems”). Liu thus discloses limitation 3[preamble]. Ex. 1113 ¶124.

1. Limitation 3[a] is obvious in light of Liu and the knowledge of a POSITA

In its “Initial Claim Chart” showing infringement contentions in concurrent district court litigation, Patent Owner reads the “polymer emulsion” on an “acrylic latex” component of paint. Ex. 1120 at 9, 16, 23, 30, 44. The ’842 Patent admits that acrylic latex paint components were known. For instance, Example 1 of the patent included a “commercial water based acrylic latex, REVACRYL 1A,” that was “supplied” by a third party. Ex. 1101 at 4:6-8. Further, the use of acrylic latex polymer emulsions was ubiquitous. In *Organic Coatings; Science and Technology*, the authors provided a “formulation recommended by a latex manufacturer for a ‘high quality’ exterior white house paint.” Ex. 1117 at 315. The formulation

included “Rhoplex AC-64,” *id.* at 316, an “all-acrylic latex . . . ,” *id.* at 319. The Rhoplex AC-64 is “a copolymer of methyl methacrylate (MMA) with ethyl or butyl acrylate. . . .” *Id.* at 319; *compare to* 842:54-60 (“The base medium can be, for example, a polymer useful in polymer emulsions wherein the polymer is selected from the group consisting of acrylic and substituted (meth)acrylates . . . and copolymers of the aforementioned.”). Through admission in the ’842 Patent or knowledge in the state of the art, a polymer emulsion of limitation 3[a] was known. Ex. 1113 ¶¶125-127.

2. Limitations 3[b], 3[c], 3[d], 3[e], and 3[f] are obvious in light of Liu and the knowledge of a POSITA.

Claim 3 covers the inclusion of the same “antimicrobial composition” of claim 1 with a polymer emulsion into a “functional fluid.”

As for the “wet state preservative,” Liu disclosed this limitation by including BIT, a known wet state preservative. Ex. 1103 at ¶0022; Ex. 1113 ¶128.

The “antimicrobial composition” elements of claim 6 are identical to claim 1.

For the same reasons as discussed above in association with claim elements 1[a], 1[b], 1[c], 1[d], and 1[e], Liu in view of the knowledge of a POSITA renders elements 3[b], 3[c], 3[d], 3[e], and 3[f] obvious. Ex. 1113 ¶¶128-129.

C. Claim 6 Is Obvious in Light of Liu and the Knowledge of a POSITA

In claim 6, the antimicrobial composition of claim 1 is mixed with a “base medium,” resulting in a “coating composition.” Claim 6 is obvious over Liu and the knowledge of a POSITA. Ex. 1113 ¶130.

1. Limitation 6[preamble] is obvious in light of Liu and the knowledge of a POSITA

Liu taught that the “stable aqueous suspension concentrate” may be added to a “paint composition; or a coating composition.” Ex. 1103 ¶0015. Thus, Liu discloses limitation 6[preamble]. Ex. 1113. ¶131.

2. Limitation 6[a] is obvious in light of Liu and the knowledge of a POSITA

Liu taught that the “stable aqueous suspension concentrate” may be added to a “paint composition.” Ex. 1103 ¶0015. A “paint” composition is one of the alternatives in the Markush group for this limitation. Ex. 1103 at cl. 6. Liu discloses limitation 6[a]. Ex. 1113 ¶132.

3. Limitations [6b], 6[c], 6[d], 6[e], and 6[f], are identical to “antimicrobial composition” elements in claim 1, and are obvious in light of Liu and the knowledge of a POSITA

The remaining elements of claim 6 are essentially identical to claim 1. Like claim 3, claim 6 introduces a “wet state preservative comprising an antimicrobial composition” having the same elements as claim 1. As discussed above in claim 3,

the antimicrobial composition concentrates of Liu are a wet state preservative because they include BIT.

The antimicrobial composition limitations of claim 6 are identical to claim 1. For the same reasons as discussed above in association with claim elements 1[a], 1[b], 1[c], 1[d], and 1[e], Liu and the knowledge of a POSITA render obvious the corresponding elements in claim 6. Ex. 1113 ¶¶134-135.

D. Claim 7 is Obvious in Light of Liu and the Knowledge of a POSITA

Claim 7 is identical to claim 1, except that the “isothiazoline-3-one” of claim 1 is limited to BIT, and the “zinc compound” of claim 1 is limited to zinc oxide. As discussed, Liu disclosed concentrate wherein the isothiazoline-3-one includes BIT; and Liu disclosed concentrates that include zinc oxide. As explained in claim 1, when the disclosed antimicrobial composition concentrates of Liu are diluted by 400x, the result is the antimicrobial composition of claim 1. Consequently, claim 7 is also obvious based for the same reasons provided for claim 1. Accordingly, claim 7 is obvious over Liu and the knowledge of a POSITA. Ex. 1113 ¶¶136-137.

E. Claims 2 and 8 Are Obvious in Light of Liu and the Knowledge of a POSITA

Claim 2 and claim 8 add limitations to their parent independent claims, claim 1 and 7, respectively, that restrict the concentrations of the isothiazoline-3-

one and zinc compound. Upon dilution of the antimicrobial composition concentrate of Liu, the resulting antimicrobial composition meets the more restrictive concentration. Ex. 1113 at ¶138. As shown above, Liu and the knowledge of a POSITA render obvious independent parent claims 1 and 7.

1. Limitations 2[a] and 8[a] are obvious in light of Liu and the knowledge of a POSITA

2[a], 8[a]	wherein component (a) is present in an amount of from 5 to 500 ppm, and
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As discussed above in the context of limitation 1[d], upon dilution of the substituted Example 19 of Liu by addition of 400x water, the concentration of BIT in the resulting antimicrobial composition would be 500 ppm BIT. Ex. 1113 ¶139. Consequently, Liu renders obvious limitation 2[a] and 8[a]. Ex. 1113 ¶¶139-140.

2. Limitations 2[b] and 8[b] are obvious in light of Liu and the knowledge of a POSITA

2[b], 8[b]	wherein component (b) is present in an amount of from 5 to 500 ppm.
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As discussed above in limitation 1[e], dilution of multiple disclosed concentrates of Liu meets the more restrictive concentration elements for zinc oxide in claims 2 and 8. As to the formula that is substituted Example 19 of Liu, diluted by addition of 400x water, the concentration of zinc oxide in the antimicrobial composition would have been 125 ppm. Ex. 1113 ¶141.

And, as to the disclosed and preferred range of zinc oxide in the concentrate, (0.2-20% w/w [2,000 ppm-200,000 ppm]) and (2-10% w/w [20,000 ppm – 100,000

ppm]), by addition of 400x water, the disclosed and preferred ranges would be 5 ppm – 500 ppm, and for the preferred range, 50 ppm to 250 ppm. *Id.* ¶142. These ranges of zinc oxide in the resulting antimicrobial concentrate are within the more restrictive concentration ranges for zinc oxide in Claims 2 and 8. *Id.* ¶142. As such, Liu renders obvious limitations 2[b] and 8[b]. Ex. 1113 ¶141-143.

F. Claims 10, 13, and 15 are obvious in light of Liu and the knowledge of a POSITA.

Claims 10, 13, and 15, dependent of independent claims 1, 3, and 6, respectively, limit the zinc compound to zinc oxide. As discussed above, Liu disclosed zinc oxide. Thus, claims 10, 13, and 15 are also obvious.

XI. GROUND 2: 4, 5, 9, 12, 17, 18, 20, 21, 24, 25, 26, 27, 28, 31, 32, 33, 36, 37, AND 38 ARE INVALID UNDER § 103 AS OBVIOUS IN LIGHT OF LIU, HANDBOOK, AND THE KNOWLEDGE OF A POSITA

All of the claims challenged in Ground 2 are dependent claims. Each includes a further limitation that is obvious by combining zinc pyrithione disclosed in Handbook with the diluted antimicrobial composition concentrate of Liu. The claims are obvious. Ex. 1113 ¶¶145-146.

A. Dependent Claims 4 and 9 Are Obvious

Dependent claims 4 and 9, each add identical limitations to their parent independent claims, claims 3 and 7 respectively.

Specifically, claims 4 and 9 add:

a co-biocide selected from the group consisting of pyrithione salts, pyrithione acids, and combinations thereof; and wherein said co-biocide is present in said

composition in an amount of from about 0.001 to about 1.0% w/w based on the total weight of the composition.

Ex. 1101 at 13:22-26; 13:66-14:5.

Zinc pyrithione was a known co-biocide with BIT. Ex. 1104 at 276, 279.

Zinc pyrithione is a pyrithione salt, specifically, the zinc salt of pyrithione (2-pyridinethiol-1-oxide). *Id.* at 290 (listing “zinc 2-pyridinethiol-1-oxide” as “zinc pyrithione”). The ’842 Patent admits that zinc pyrithione is a pyrithione salt. Ex. 1101 2:20-22 (“Useful pyrithione salts include . . . zinc pyrithione . . .”).

Handbook discloses a recommended concentration for zinc pyrithione in “architectural” applications. Ex. 1104 at 290. To a POSITA, “architectural” refers to an architectural coating, e.g., a paint, which is a type of “functional fluid” or a “coating composition” of claims 3 and 6. Ex. 1101 at 3:60-64; Ex. 1113 at ¶150. The recommended concentration in the finished architectural product is “0.1-0.5% active for architectural,” measured in “% by wt.”). Ex. 1104 at 290.

Under the proper construction of “present in an amount of,” the concentrations of the ’842 Patent claims are measured in the antimicrobial composition, not in the finished product, e.g., an architectural paint. Although Handbook discloses a concentration of zinc pyrithione in a finished product, a POSITA would know how to calculate the amount of zinc pyrithione needed in an antimicrobial composition that is then added to make the “coating composition” or “functional fluid” of claims 3 and 6 to yield the target concentration in a functional

fluid or coating composition. Indeed, Liu disclosed that the “concentrate is easily dilutable with water.” Ex. 1103 ¶0025. Thus, it was well within the skill of a POSITA to determine the amount of zinc pyrithione that should be added to antimicrobial composition that could yield a finished product with the recommended concentration in Handbook. Ex. 1113 ¶151.

A POSITA would have had ample reason to combine zinc pyrithione of Handbook, a known dry-film preservative, Ex. 1104 at 279-280, with the diluted antimicrobial composition concentrate of Liu in order to provide additional dry-state preservative characteristics in addition to the wet-state preservation provided by BIT. Given that it was known that BIT and zinc pyrithione were used as co-biocides, and zinc pyrithione was used by a POSITA at a concentration that would yield the recommended concentration of Handbook in a finished product, a POSITA would have had a reasonable expectation of success. A POSITA also would have had a reasonable expectation of success because blending biocides was common practice. Ex. 1113 ¶152; *see also* Ex. 1104 at 265.

Thus, it was well within the skill of a POSITA to determine the amount of zinc pyrithione that should be added the antimicrobial composition to yield a finished product with the recommended concentration. A POSITA would be motivated to include zinc pyrithione within the claimed range, such as 1%, because such formulation will be diluted in the final “functional fluid” or “coating

composition” in order to be within the dosage range of 0.1-0.5% described in Handbook. Ex. 1104 at 290. The technique of diluting such formulation was well-known and would achieve a predictable result. *Id.*; Ex. 1113 ¶153. Thus, claims 4 and 9 are unpatentable. Ex. 1113 ¶147-154.

B. Dependent Claims 12, 20, 27, and 32 Are Obvious

Dependent claims 12, 20, 27, and 32 limit their parent claims 1, 10, 13, and 15, respectively, by adding the following limitation:

wherein the composition further comprises a co-biocide selected from the group consisting of pyrrithione salts, pyrrithione acids, and combinations thereof.

Ex. 1101 at 14:9-13; 14:32-34; 14:52-55; 15:1-4. Claims 12, 20, 27, and 32 are obvious for the same reasons as claims 4 and 9, which include the same limitation. Ex. 1113 ¶¶155.

C. Dependent Claim 17 Is Obvious

Dependent claim 17 limits claim 1 by adding the following restriction.

the composition consisting of the at least one isothiazolin-3-one, the at least one zinc compound, optionally at least one polymer base medium, and optionally a co-biocide.

Ex. 1101 at 14:22-25. As discussed above, Petitioner asserts that this claim is a closed claimed and the “optional” claim limitations are not limiting. Nonetheless, all the recited elements in claim 17 are disclosed in the prior art.

Assuming all of the recited components must be present, claim 17 has the same scope as claim 32, which requires a co-biocide over the composition of

independent claim 6, which itself requires a base medium. Therefore, for the same reasons as provided for dependent claim 32, claim 17 is obvious. Ex. 1113 ¶¶156-158.

D. Dependent Claims 18, 21, and 28 Are Obvious

Dependent claims 21 and 28 limit their respective parent claims, 20 and 27, by identifying that “the pyrithione salt is zinc pyrithione.” Ex. 1101 14:36-37; 14:56-57. Claim 18 adds to claim 7 that the composition “further comprises zinc pyrithione.” *Id.* at 14:22-25.

As shown above for claims 20 and 27, the pyrithione salt disclosed in Handbook is zinc pyrithione. Ex. 1104 at 279-80. Thus, claims 21 and 28 are obvious for the same reasons as claims 20 and 27.

As to claim 8, the discussion above for claims 4 and 9 describes the disclosure of zinc pyrithione in Handbook and the reasons why a POSTIA would have included zinc pyrithione as a co-biocide with BIT of claim 7 and had a reasonable expectation of success. For the same reasons, claim 8 is obvious. Ex. 1113 ¶¶159-161.

E. Dependent Claims 5, 24, 31, and 36 Are Obvious

Dependent claims 5, 24, 31, and 36, each limit their parent independent claim (1, 3, and 6, respectively) by adding a limitation:

the composition further comprises a pyrrithione salt selected from the group consisting of copper pyrrithione, zinc pyrrithione, sodium pyrrithione, and combinations thereof

Ex. 1101 at 14:44-47; 14:64-67; 15:12-15. Claim 5 restricts that the “pyrrithione salts” of claim 4 consist of the same group.

As discussed above, zinc pyrrithione, the zinc salt of pyrrithione (2-pyridinethiol-1-oxide), is a pyrrithione salt as admitted in the ’842 Patent. Ex. 1101 at 2:20-22; Ex. 1104 at 290 (listing “zinc 2-pyridinethiol-1-oxide” as “zinc pyrrithione.”).

As described above, a POSITA would have had ample reason to combine zinc pyrrithione of Handbook with the antimicrobial composition described for the parent claims 1, 3, and 6, and would have had a reasonable expectation of success in doing so because zinc pyrrithione was a known co-biocide with BIT for architectural applications like paint, and Handbook provided a recommended concentration. Ex. 1104 at 276, 279, 290; Ex. 1113 ¶164. Claims 5, 24, 31, and 36 are obvious. Ex. 1113 ¶¶162-165.

F. Dependent Claims 25, 26, 33, and 37 Are Obvious

Dependent claims 25, 26, 33, and 37 restrict their parent claims, which are 24, 4, 32, and 36, respectively, by identifying that “the pyrrithione salt comprises zinc pyrrithione.”

As shown above for parent claims 24, 4, 32, and 36, the pyrrithione salt disclosed in Handbook is zinc pyrrithione. Ex. 1104 at 279-80. Claims 25, 26, 33, and 37 are obvious for the same reasons as the parent claims. Ex. 1113 ¶¶166-168.

G. Dependent Claim 38 Is Obvious

Dependent claim 38 limits claim 7 in that the “composition further comprises a pyrrithione salt selected from the group consisting of copper pyrrithione, sodium pyrrithione, and combinations thereof.” Ex. 1101 at 15:18-21. Handbook discloses sodium pyrrithione as a dry-film preservative. Ex. 1104 at 280. Handbook provides a recommended concentration for sodium pyrrithione. *Id.* at 290.

A POSITA would have been motivated to combine sodium pyrrithione of Handbook with the antimicrobial composition of claim 7. Handbook taught “[i]f zinc oxide is also present in the coating formulation, then the sodium pyrrithione will react with the zinc oxide to become an insoluble zinc complex that will provide dry-film protection against the growth of both fungi and algae.” Ex. 1104 at 280. A POSITA would have combined sodium pyrrithione with the combination that Petitioner identified for claim 7, which included zinc oxide, to enhance the composition’s dry-film preservative characteristics. A POSITA would have had a reasonable expectation of success because blending such biocides was common practice. Ex. 1113 ¶¶169-172; *see also* Ex. 1104 at 265.

XII. GROUND THREE: ALTERNATIVELY, IF THE CLAIMS ARE CONSTRUED TO MEASURE CONCENTRATION IN A FUNCTIONAL FLUID AND NOT AN ANTIMICROBIAL COMPOSITION, THEN ALL CHALLENGED CLAIMS ARE OBVIOUS IN LIGHT OF HANDBOOK AND THE KNOWLEDGE OF A POSITA.

If the claims are construed contrary to the specification such that concentrations cover the functional fluid, and not the antimicrobial composition that is incorporated into a functional fluid, *contra inter alia*, Ex. 1101 at 3:8-9, then the claims are still invalid.

Handbook identified BIT as a wet-state preservative, and provided a recommended concentration of BIT—0.1-0.3% by weight of a 20% solution of BIT. Ex. 1104 at 290. This equates to 200 ppm-600 ppm of BIT, as shown in the calculations above, within the broader BIT concentration range of claims 1, 3, 6, and 7, and nearly matching the narrower range in claims 2 and 8. Ex. 1113 ¶174. Handbook also disclosed zinc pyrithione as a dry-film preservative, and provided a finished product concentration (0.1-0.5% for architectural applications). Ex. 1104 at 279-280. This is within the concentration of zinc pyrithione in claims 4 and 9. Ex. 1113 ¶174. Handbook stated that when zinc pyrithione is used “prevention of ferric pyrithione formation in the coating is easily accomplished by the addition of 0.05% zinc oxide.” Ex. 1104 at 280. This equates to 500 ppm, within claimed ranges. When BIT is incorporated in the recommended amount, with zinc

pyrithione in the recommended amount with the recommended amount of zinc oxide, the result is the '842 Patent claims. Ex. 1113 ¶174.

If the Challenged Claims are not anticipated by Handbook, then a POSITA had a motivation to combine BIT in the recommended concentration of Handbook (200-600 ppm BIT) with zinc pyrithione in the recommended concentration of Handbook (0.1%-0.5%), together with zinc oxide at the recommended level (500 ppm) to prevent undesired discoloration of the composition. Ex. 1113 ¶175.

Whereas, according to the Handbook, BIT is primarily a preservative in the wet-state, Ex. 1104 at 274-275 (section on isothiazoline-3-ones including BIT in subsection on “Wet-State Preservatives”) the section on zinc pyrithione is in the dry-film preservative subsection. *Id.* at 279-280. A POSITA would have known that coatings and functional fluids must have both wet-state preservative and dry-state preservative characteristics. *Id.* at 264; Ex. 1113 ¶175. Handbook stated “bacteria are the principle degraders of paint in the wet state.” Ex. 1104 at 264. And, “[p]reservation of the dry paint film against microbial growth is also necessary for most exterior and some interior applications.” *Id.* at 264.

Moreover, Handbook instructed, “[i]n Europe, blends of biocides are commonly used in coatings.” Handbook at 265. Nonetheless, development of biocide blends was “the focus of product development by suppliers looking for new opportunities.” *Id.* at 265-266. The blend of BIT and zinc pyrithione would

have been routine task for a POSITA to achieve a predictable result of a formulation with blending biocides. Ex. 1113 ¶176.

A. Handbook and the Knowledge of a POSITA Discloses or Renders Obvious Claim 1

Handbook expressly disclosed or rendered obvious all elements of claim 1. It would have been obvious to a POSITA to combine BIT at the concentration recommended in Handbook with zinc pyrithione at the concentration recommended in Handbook, adding the recommended amount of zinc oxide to prevent undesirable coloration. Ex. 1113 ¶177.

1. Handbook discloses or renders obvious limitation 1[preamble]

1[preamble]	An antimicrobial composition comprising:
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Handbook disclosed an antimicrobial composition. Handbook stated “fungi can thrive and multiply quickly to spoil the paint,” so “a wet state preservative must be used if the paint will not be used within a few days.” Ex. 1104 at 267. Handbook recommended the use of BIT as a wet-state preservative. *Id.* at 275. Handbook discloses an antimicrobial composition. Ex. 1113 ¶¶178-179.

2. Handbook discloses or renders obvious limitation 1[a]

1[a]	(a) at least one isothiazolin-3-one selected from the group consisting of 1,2-benzisothiazolin-3-one, N-(n-butyl)-1,2-benzisothiazolin-3-one, and combinations thereof;
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The Handbook discloses an isothiazoline-3-one, specifically 1,2-benzisothiazoline-3-one as a wet state preservative in an antimicrobial

composition. *Id.* at 275. Thus, Handbook disclosed or rendered obvious limitation 1[b]. Ex. 1113 ¶¶180-181.

3. Handbook discloses or renders obvious limitation 1[b]

1[b]	(b) at least one zinc compound comprising zinc chloride, zinc oxide, or a combination thereof;
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As described in detail above, Handbook disclosed that when zinc pyrrithione is used as an antimicrobial, 0.05% zinc oxide should be added to the composition to prevent discoloration. Ex. 1104 at 280. Thus, Handbook disclosed or rendered obvious limitation 1[b]. Ex. 1113 ¶¶182-183.

4. Handbook discloses or renders obvious limitation 1[c]

1[c]	wherein the isothiazolin-3-one is present in an amount of from 1 to 500 ppm,
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The Handbook disclosed a recommended concentration for 1,2-benzisothiazoline-3-one (BIT), when used in “architectural” applications. Ex. 1104 at 290. The recommended concentration is 0.1-0.3% by weight of a 20% solution of BIT. *Id.* at 287. As shown in the calculations above, this equals 200-600 ppm BIT. Thus, Handbook disclosed or rendered obvious limitation 1[c]. Ex. 1113 ¶¶184-185.

5. Handbook discloses or renders obvious limitation 1[d]

1[d]	wherein the zinc compound is present in an amount of from 5 to 200,000 ppm, and
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Handbook instructed that if zinc pyrithione is used in a composition, Handbook recommended adding 0.05% zinc oxide to prevent discoloration. *Id.* As shown in the calculations above, this equals 500 ppm zinc oxide in composition. Thus, Handbook disclosed or rendered obvious limitation 1[d]. Ex. 1113 ¶186-187.

6. Handbook disclosed or rendered obvious limitation 1[e]

1[e]	wherein the weight ratio of the isothiazolin-3-one to the zinc compound is from 1:100 to 100:1.
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A POSITA could determine that the weight ratio of isothiazoline-3-one to the zinc compound can be calculated from the relative amounts of the isothiazoline-3-one and zinc compound present that included BIT at the recommended concentration and zinc oxide at the recommended concentration. As shown in the calculations above, the weight ratio of the isothiazoline-3-one to zinc compound (in the Handbook, BIT to zinc oxide), ranges from 1:2.5 to 1:1.2. Ex. 1113 ¶188.

7. It would have been obvious to combine the disclosures of BIT and zinc oxide of Handbook.

A POSITA would have been motivated to combine BIT in the recommended concentration of Handbook (200-600 ppm BIT) with zinc pyrithione in the recommended concentration of Handbook (0.1%-0.5%), together with zinc oxide at the recommended level (500 ppm) to prevent undesired discoloration of the composition. Ex. 1113 ¶189. As described above, a POSITA would have been

motivated to utilize zinc pyrithione to obtain increased dry-film preservation, with BIT present in composition as a wet-state preservative. *Id.* Whereas, according to the Handbook, BIT is primarily a preservative in the wet-state, Ex. 1104 at 274-275, zinc pyrithione is described as a dry-film preservative. *Id.* at 279-280; Ex. 1113 ¶189. Discoloration when zinc pyrithione is added is “easily accomplished by the addition of zinc oxide.” Ex. 1104 at 280; Ex. 1113 ¶189.

A POSITA would have known that coatings and functional fluids must have both wet-state preservative and dry-state preservative characteristics. Ex. 1104 at 264. Handbook stated that “bacteria are the principle degraders of paint in the wet state.” *Id.* And, “[p]reservation of the dry paint film against microbial growth is also necessary for most exterior and some interior applications.” *Id.* This provides ample reason to combine BIT with zinc pyrithione. And, if zinc pyrithione is added, a POSITA would have been motivated to prevent undesired discoloration of the composition by adding the recommended amount of zinc oxide. *Id.* at 280; Ex. 1113 ¶190.

A POSITA would have a reasonable expectation of success in this combination as blending biocides, like BIT and zinc pyrithione (including zinc oxide), was common. Ex. 1104 at 265; Ex. 1113 ¶191. This combination is nothing more than using known components in a predictable manner to achieve a predictable result. Ex. 1113 ¶191.

B. Handbook Disclosed or Renders Obvious Claim 3

Claim 3 covers the inclusion of the “antimicrobial composition” of claim 1 with a polymer emulsion into a “functional fluid.” As described below, Handbook discloses or renders obvious all elements of claim 3. Ex. 1113 ¶192.

1. Handbook discloses or renders obvious limitation 3[preamble]

Handbook disclosed a variety of functional fluids. According to the ’842 Patent, “typical functional fluids include coating compositions, such as paints” Ex. 1101 at 3:60-64. Handbook reported that “[b]acteria are principle degraders of paint in the wet state” and that “[p]reservation of dry paint film against microbial growth is also necessary for most exterior and some interior applications.” Ex. 1104 at 264. Thus, Handbook disclosed a functional fluid, specifically, a “paint.” Ex. 1113 ¶193-194.

2. The ’842 Patent admits that limitation 3[a] was known

In its “Initial Claim Chart” showing infringement contentions in concurrent district court litigation, Patent Owner reads the “polymer emulsion” on an “acrylic latex” component of paint. *E.g.*, Ex. 1120 at 9, 16, 23, 30, 44. The ’842 Patent admits that acrylic latex paint components were known. For instance, Example 1 of the patent included a “commercial water based acrylic latex, REVACRYL 1A,” that was “supplied” by a third party. *Id.* at 4:6-8. Further, the use of acrylic latex polymer emulsions was ubiquitous. In Organic Coatings; Science and Technology,

the authors provided a “formulation recommended by a latex manufacturer for a ‘high quality’ exterior white house paint.” Ex. 1117 at 315. The formulation included “Rhoplex AC-64,” *id.* at 316, an “all-acrylic latex . . . ,” *id.* at 319. The Rhoplex AC-64 is “a copolymer of methyl methacrylate (MMA) with ethyl or butyl acrylate. . . .” *Id.* at 319; *compare to* Ex. 1101 3:54-60 (“The base medium can be, for example, a polymer useful in polymer emulsions wherein the polymer is selected from the group consisting of acrylic and substituted (meth)acrylates . . . and copolymers of the aforementioned.”). Through admission in the ’842 Patent or knowledge in the state of the art, a polymer emulsion of limitation 3[a] was known. Ex. 1113 ¶195.

3. Handbook disclosed or rendered obvious limitations 3[b], 3[c], 3[d], 3[e], and 3[f].

Element [3b] introduces that inclusion of a “wet state preservative comprising an antimicrobial composition” having the same elements as the antimicrobial composition of claim 1. The remaining elements of claim 3 are identical to claim 1.

Handbook described benzisothiazoline (1,2 benzisothiazoline-3-one), also known as BIT, as a wet-state preservative. Ex. 1104 at 275. By including an isothiazoline-3-one in an antimicrobial composition, the composition meeting claim 3 is a wet state preservative. Ex. 1113 ¶197.

For the same reasons as discussed above in association with claim limitations 1[a], 1[b], 1[c], 1[d], and 1[e], Handbook discloses or renders obvious the corresponding limitations in claim 3. *Id.* at ¶¶196-198.

C. Handbook Disclosed or Rendered Obvious '842 Patent Claim 6

Claim 6 incorporates the “antimicrobial composition” of claim 1 with a “base medium” to yield a “coating composition.” The “antimicrobial composition” in claim 6 is identical to the “antimicrobial composition” of claim 3. Thus, the same disclosures and proof that taught the “wet state preservative comprising an antimicrobial composition” of claim 3 also taught the “antimicrobial composition” elements 6[b], 6[c], 6[d], 6[e], and 6[f] of claim 6. Ex. 1113 ¶199.

1. Handbook disclosed or rendered obvious limitation 6[preamble]

According to the '842 Patent, “typical functional fluids include *coating compositions, such as paints . . .*” (Ex. 1101 3:60-64 (emphasis added).)

Handbook reported “[b]acteria are principle degraders of paint in the wet state” and “[p]reservation of dry paint film against microbial growth is also necessary for most exterior and some interior applications.” Ex. 1104 at 264. Thus, Handbook disclosed a coating composition. Ex. 1113 ¶¶200-201.

2. Handbook disclosed or rendered obvious limitation 6[a]

Handbook disclosed paint, a member of the Markush group. Specifically, “[b]acteria are principle degraders of paint in the wet state” and “[p]reservation of

dry paint film against microbial growth is also necessary for most exterior and some interior applications.” Ex. 1104 at 264. Thus, Handbook disclosed a base medium, specifically, a “paint.” Ex. 1113 ¶202.

3. Handbook disclosed or rendered obvious elements [6b], 6[c], 6[d], 6[e], and 6[f], which are identical to “antimicrobial composition” elements in claim 1.

The remaining elements of claim 6 are identical to claim 3. Element [6b] introduces that inclusion of a “wet state preservative comprising an antimicrobial composition” having the same elements as the antimicrobial composition of claim 3. Ex. 1113 ¶203.

For the same reasons as discussed above in association with claim limitations 3[b], 3[c], 3[d], 3[e], and 3[f], Handbook discloses the identical limitations in claim 6. Ex. 1113 ¶204.

D. Handbook Disclosed or Rendered Obvious '842 Patent Claim 7

Claim 7 is identical to claim 1, except that the “isothiazoline-3-one” of claim 1 is limited to BIT, and the “zinc compound” of claim 1 is limited to zinc oxide. Ex. 1101 at 12:57-13:2 *compared with* 13:53-61. Handbook disclosed BIT as the isothiazoline-3-one and zinc oxide as the zinc compound of claim 1. As a result, claim 7 is obvious for the same reasons as claim 1. Ex. 1113 ¶205.

E. Claims 2 and 8 are obvious over Handbook and the knowledge of a POSITA

Claims 2 and 8 add limitations to their parent independent claims, claim 1 and 7, respectively, that further limits the concentrations of the isothiazoline-3-one (in claim 7, BIT) and zinc compound (in claim 7, zinc oxide). As shown above, Handbook discloses or renders obvious independent parent claims 1 and 7. Ex. 1113 ¶¶206.

As shown above, the concentration of BIT in the antimicrobial composition disclosed by Handbook is 200-600 ppm BIT and the concentration of zinc oxide in the antimicrobial composition disclosed by Handbook is 500 ppm. Ex. 1104 at 287, 290. Ex. 1113 ¶.

Claims 2 and 8 are therefore obvious over the disclosures of Handbook and the knowledge of a POSITA, as there are no unexpected results relating to these claims. *In re Geisler*, 116 F.3d 1465, 1469-70 (Fed. Cir. 1997) (when overlap between a claimed range and prior art range is present, claim is obvious absent evidence of unexpected results); *Dillon*, 919 F.2d at 692-93; Ex. 1113 ¶¶206-208.

F. Claims 10, 13, and 15 are Obvious in Light of Handbook and the Knowledge of a POSITA

Claims 10, 13, and 15, dependent of independent claims 1, 3, and 6, respectively, limits the zinc compound to zinc oxide. In Petitioner's showing of

obviousness of claims 1, 3, and 6, the zinc compound was zinc oxide. Thus, claims 10, 13, and 15 are also obvious. Ex. 1113 ¶¶209.

G. Dependent Claims 4 and 9 Are Obvious

Dependent claims 4 and 9, each add identical restrictions to their parent independent claims, which are claims 3 and 7, respectively. Ex. 1113 ¶¶210.

Specifically, claims 4 and 9 add:

a co-biocide selected from the group consisting of pyrithione salts, pyrithione acids, and combinations thereof; and wherein said co-biocide is present in said composition in an amount of from about 0.001 to about 1.0% w/w based on the total weight of the composition.

Ex. 1101 at 13:22-27; 13:66-14:4.

Zinc pyrithione was a known co-biocide with BIT. Ex. 1104 at 276, 279.

Zinc pyrithione is a pyrithione salt, specifically, the zinc salt of pyrithione (2-pyridinethiol-1-oxide). *Id.* at 290 (listing “zinc 2-pyridinethiol-1-oxide” as “zinc pyrithione”). The ’842 Patent admits that zinc pyrithione is a pyrithione salt. Ex. 1101 at 2:20-22 (“Useful pyrithione salts include . . . zinc pyrithione . . .”).

Handbook discloses a recommended concentration for zinc pyrithione in “architectural” applications. Ex. 1104 at 290. To a POSITA, “architectural” refers to an architectural coating, e.g., a paint, a type of “functional fluid” or a “coating composition.” Ex. 1101 at 3:60-64; Ex. 1113 ¶213. The recommended concentration in the finished architectural product is “0.1-0.5% active for architectural,” measured in “% by wt,” which is within the claimed range. Ex.

1104 at 290. Thus, Handbook and the knowledge of a POSITA renders obvious dependent claims 4 and 9. Ex. 1113 ¶¶213.

H. Dependent Claims 12, 20, 27, and 32 Are Obvious

Dependent claims 12, 20, 27, and 32 limit their parent claims 1, 10, 13, and 15, respectively, by adding the following limitation:

wherein the composition further comprises a co-biocide selected from the group consisting of pyrrithione salts, pyrrithione acids, and combinations thereof.

Ex. 1101 at 14:9-13; 14:32-34; 14:52-55; 15:1-4. Claims 12, 20, 27, and 32 are obvious for the same reasons as claims 4 and 9, which include the same Markush group limitation. Ex. 1113 ¶¶214-215.

I. Dependent Claim 17 Is Obvious.

Dependent claim 17 limits claim 1 by adding the following limitation:

the composition consisting of the at least one isothiazolin-3-one, the at least one zinc compound, optionally at least one polymer base medium, and optionally a co-biocide.

Ex. 1101 at 14:22-25.

As discussed above, Petitioner asserts that this claim is a closed claimed and the “optional” claim limitations are not limiting. Nonetheless, all the recited elements in claim 17 are disclosed in the prior art.

Assuming all of the recited components must be present, claim 17 has the same scope as claim 32, which requires a co-biocide over the composition of

independent claim 6, which itself requires a base medium. Therefore, for the same reasons as provided for dependent claim 32, claim 17 is obvious. Ex. 1113 ¶¶216.

J. Dependent Claims 18, 21, and 28 Are Obvious

Dependent claims 18, 21, and 28 limit their respective parent claims, 20 and 27, by identifying that “the pyrrithione salt is zinc pyrrithione.” Ex. 1101 at 14:36-37; 14:56-57. Claim 18 adds to claim 7 that the composition “further comprises zinc pyrrithione.” Ex. 1101 at 14:22-25.

As shown above for claims 20 and 27, the pyrrithione salt on disclosed in Handbook is zinc pyrrithione. Ex. 1104 at 279-80. Thus, claims 21 and 28 are obvious for the same reasons as claims 20 and 27. Ex. 1113 ¶220.

As to claim 18, the discussion above for claims 4 and 9 describes the disclosure of zinc pyrrithione in Handbook and the reasons why a POSTIA would have included zinc pyrrithione as a co-biocide with BIT of claim 7 and had a reasonable expectation of success. For the same reasons, claim 8 is obvious. Ex. 1113 ¶221.

K. Dependent Claims 5, 24, 31, and 36 Are Obvious

Dependent claims 5, 24, 31, and 36, each limit their parent independent claim (1, 3, and 6, respectively) by adding a limitation:

the composition further comprises a pyrrithione salt selected from the group consisting of copper pyrrithione, zinc pyrrithione, sodium pyrrithione, and combinations thereof.

Ex. 1101 at 14:44-47; 14:64-68; 15:12-15. Claim 5 restricts that the “pyrithione salts” of claim 4 consisting of the same group.

As discussed above in claim 4, zinc pyrithione is a pyrithione salt as admitted in the '842 Patent. Ex. 1101 2:20-22; *see also* Ex. 1104 at 290 (listing “zinc 2-pyridinethiol-1-oxide” as “zinc pyrithione”). Handbook disclosed zinc pyrithione. Ex. 1104 at 279-80. As such, claims 5, 24, 31, and 36 are unpatentable. Ex. 1113 at 222-223.

L. Dependent Claims 25, 26, 33, and 37 Are Obvious

Dependent claims 25, 26, 33, and 37 restrict their parent claims, which are 24, 4, 32, and 36, respectively, by identifying that “the pyrithione salt comprises zinc pyrithione.”

As shown above, for the parent claims 24, 4, 32, and 36, the pyrithione salt disclosed in Handbook is zinc pyrithione. Thus, claims 25, 26, 33, and 37 are obvious for the same reasons. Ex. 1113 ¶¶224-225.

M. Dependent claim 38 is obvious

Dependent claim 38 limits claim 7 in that the “composition further comprises a pyrithione salt selected from the group consisting of copper pyrithione, sodium pyrithione, and combinations thereof.” Ex. 1101 at 15:18-21. Handbook disclosed sodium pyrithione as a dry-film preservative. Ex. 1104 at 280.

A POSITA would have been motivated to combine sodium pyrithione of Handbook with the antimicrobial composition of claim 7 discussed above. Handbook taught “[i]f zinc oxide is also present in the coating formulation, then the sodium pyrithione will react with the zinc oxide to become an insoluble zinc complex that will provide dry-film protection against the growth of both fungi and algae.” Ex. 1104 at 280. A POSITA would have combined sodium pyrithione with the combination Petitioner identified for claim 7, which included zinc oxide, to enhance the composition’s dry-film preservative characteristics. A POSITA would have had a reasonable expectation of success because blending such biocide was common practice. Ex. 1113 ¶¶228; *see also* Ex. 1104 at 265. Claim 38 is obvious. Ex. 1113 ¶¶226-229.

XIII. THE PURPORTED SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS DO NOT SUPPORT THE CLAIM SCOPE OF THE CHALLENGED CLAIMS

The Challenged Claims of the ’842 Patent were the subject of intensive examination. Ex. 1102. In order to obtain the narrow claims that issued in the ’842 Patent, the applicant submitted a declaration from Mr. Scott Brown and Ms. Helen Hyde, neither of which is an inventor of ’842 Patent. Ex. 1102 at 670-676. Mr. Brown described testing paint formulations that included BIT and zinc oxide. *Id.* Ms. Hyde described testing formulations that included BIT and zinc chloride. *Id.*; Ex. 1113 ¶¶231.

Mr. Brown tested a variety of paint formulations as shown below:

The results of the challenge testing are shown in the table below:

Ratio of BIT/ZnO	Conc. Of BIT/ZnO (ppm)	1 st Challenge	2 nd Challenge	3 rd Challenge	4 th Challenge	5 th Challenge
		72 hour	72 hour	72 hour	72 hour	72 hour
Blank	0	5	5	5	5	5
BIT only	60	0	1	0	0	5
1 : 0.17	60 : 1	0	0	0	0	2
1 : 0.5	60 : 30	0	0	0	0	0
1 : 1.0	60 : 60	0	0	0	0	1(1)*
1 : 1.5	60 : 90	0	0	0	0	0
1 : 2.0	60 : 120	0	0	0	0	0
1 : 2.6	60 : 160	0	0	0	0	0
1 : 5.0	60 : 300	0	0	0	0	0
1 : 10.0	60 : 600	0	0	0	0	0
1 : 50.0	60 : 3000	0	0	0	0	0
1 : 100.0	60 : 6000	0	0	0	0	0
ZnO only	1	5	5	5	5	5
ZnO only	30	5	5	5	5	5
ZnO only	60	5	5	5	5	5
ZnO only	90	5	5	5	5	5
ZnO only	120	5	5	5	5	5
ZnO only	160	5	5	5	5	5
ZnO only	300	5	5	5	5	5
ZnO only	600	5	5	5	5	5
ZnO only	3000	5	5	5	5	5
ZnO only	6000	5	5	5	5	5

*Only a single colony was observed on the plate, likely an artifact from airborne contamination.

Ex. 1102 at 672.

As shown the in the table for the formulations that included both BIT and zinc oxide, Mr. Brown only varied the amounts of zinc oxide. From the experiments described in the table, the applicant asserted that the formulation with BIT and zinc oxide exhibited “unexpected results” that may be “indicative of synergism between BIT and ZnO.” Ex. 1102 at 668. However, these results do

not commensurate with the claim scope of the Challenged Claims and do not reflect any unknown synergism between BIT and zinc oxide. Ex. 1113 ¶¶233.

Ms. Hyde tested a variety of formulations and provided the below results:

Compound	Weight Ratio of BIT:ZnCl ₂	Compared with BIT	MIC (ppm) of BIT/ZnCl ₂ After 48 Hours Contact	Average FIC Values		
				BIT	ZnCl ₂	Total
BIT	-	-	50	1	0	1
ZnCl ₂	-	-	468.8	0	1	1
BIT:ZnCl ₂ mixtures	100:1	Reduced concentration of ZnCl ₂	46.25/0.46	0.925	0.001	0.93
	75:1		47.22/0.64	0.944	0.001	0.95
	50:1		47.22/0.94	0.944	0.02	0.96
	25:1		48.61/1.94	0.972	0.004	0.98
	10:1		43.05/4.3	0.861	0.009	0.87
	1:1	Increased concentration of ZnCl ₂	25/25	0.5	0.053	0.55
	1:10		13.54/135.4	0.270	0.288	0.56
	1:25		9.72/243.1	0.194	0.518	0.71
	1:50		5.04/252.1	0.101	0.537	0.64
	1:75		4.0/300	0.080	0.64	0.72
	1:100		3.34/334.3	0.067	0.71	0.78

Ex. 1102 at 675.

Ms. Hyde does not state whether the formulations included a polymer emulsion or base medium. The formulations only tested BIT and zinc chloride in combination. The concentration of BIT in the formulations only range from 3.34-48.61 ppm, and zinc chloride was in the range of 0.46-334ppm. From the experiments described in the table, the applicant asserted that the formulation with BIT and zinc chloride exhibited “unexpected results” that may be “indicative of synergism between BIT and ZnCl.” Ex. 1102 at 676. However, these results do not commensurate with the claim scope of the Challenged Claims and do not reflect any unknown synergism between BIT and zinc chloride. Ex. 1113 at ¶¶235.

Unexpected results must be shown to occur over the entire claimed range in order to be objective secondary considerations of non-obviousness. *See In re Peterson*, 315 F.3d 1325, 1329-31 (Fed. Cir. 2003); *In re Grasselli*, 713 F.2d 731, 741, 218 USPQ 769, 777 (Fed. Cir. 1983). Here, there is no such showing as to several limitations.

First, claim 3 requires a functional fluid composition that includes a “polymer emulsion,” and claim 6 requires a coating composition that includes a “base medium.” Ex. 1101 at 13:6-21; 13:32-53. The Hyde Declaration does not describe that anything other than the formulations with BIT and zinc chloride were tested. Ex. 1102 at 675. Thus, the tested formulations in the Hyde Declaration do not commensurate with the scope of the claims 3 and 6. Likewise, claims 1 and 7 are directed at an “antimicrobial composition.” Ex. 1101 at 12:57-13:2; 13:54-61. The Brown Declaration states that the compositions being tested with “standard interior acrylic paint formulations,” i.e. something more than just an antimicrobial composition. Ex. 1102 at 672. Thus, the formulations being tested in the Brown Declaration do not commensurate with the scope of claims 1 and 7. Ex. 1113 ¶236.

Second, the Challenged Claims require BIT be present “in an amount from 1 to 500ppm.” Ex. 1101 at 12:64-65; 13:16-17; 13:47-48; 13:56-57. However, the tested samples in the Brown declaration only had “60 ppm BIT concentration.” Ex. 1102 at 672. Likewise, the tested samples in the Hyde Declaration included

BIT in a range of 3.34-48.61 ppm. *Id.* at 675. None of the tested samples in either declaration included BIT within the entire claimed range of 1-500pm, with the greatest amount only being 60 ppm. As such, the results in the declarations do not commensurate with the claimed range. Ex. 1113 at ¶¶237.

Third, the Challenged Claims require the zinc compound to be present in an amount of “5 to 200,000 ppm.” Ex. 1101 at 12:66-67; 13:18-19; 13:49-50; 13:59-60. The tested samples in the Brown Declaration only included zinc oxide from 1-6,000 ppm. Ex. 1102 at 672. Likewise, the tested samples in the Hyde Declaration only included zinc chloride from 0.46-334.3 ppm. *Id.* at 675. As such, the zinc compound amounts in the tested samples do not cover the entire claimed range. Ex. 1113 ¶238.

Fourth, claims 4-5, 9, 12, 18, 20-38 includes a pyrithione co-biocide. Ex. 1101 at 14: 3-5; 14:32-34. The samples tested in the Brown Declaration and Hyde Declaration did not include any pyrithione co-biocide. Ex. 1102 at 670-676. Thus, the results do not commensurate with the scope of these claims. Ex. 1113 ¶239.

For any one reason provided above or any combination of them, the results shown in the Brown and Hyde Declarations are not objective secondary considerations of non-obviousness for the Challenged Claims because they do not commensurate with the scope of the Challenged Claims. Ex. 1113 ¶240.

Lastly, the Brown Declaration's assertion that the alleged "unexpected results" may be "indicative of synergism between BIT and ZnO" was not an unknown attribute or synergism between these compounds in these materials. It was known for over a decade before the filing of the '842 Patent that BIT and zinc oxide were synergists "for mildew resistance in aqueous paint formulations." Ex. 1109 at 1:19-21. Indeed, in a 1978 textbook disclosed that using BIT and zinc oxide in paints had a synergistic effect by providing an "effective" inhibition on microbial growth. Ex. 1112 pg. 79. The results in the Brown Declaration are nothing more than the expected results that had been known for decades prior to the filing of the '842 Patent. Ex. 1113 ¶241.

Likewise, the Hyde Declaration asserts that there may be a "synergism between BIT and ZnCl." However, such synergy was well known as U.S. Patent No. 4,150,026, issued in 1979, discloses that compounds with BIT and zinc chloride can be used as bactericide in "water-based paints." Ex. 1116 at 15:62-67; 1:5-45; 2:36-68. As such, the results in the Hyde Declaration are nothing more than the expected results that had been known for decades prior to the filing of the '842 Patent. Ex. 1113 ¶242.

As such, the declarations do not provide any "unexpected results" that rise to objective secondary considerations of non-obviousness. Ex. 1113 ¶¶230-243.

XIV. CONCLUSION

For the foregoing, reasons, Institution should be granted, and all Challenged Claims should be found unpatentable.

XV. MANDATORY NOTICES – 37 C.F.R. § 42.8

A. Real Party in Interest

The Sherwin-Williams Company is the real party in interest.

B. Related Matters

Patent Owner is asserting the '842 Patent is the United States District Court for the District of Delaware (C.A. No. 1:18-cv-02037-LPS).

C. Lead and Back-Up Counsel and Service Information

Lead Counsel	Back-up Counsel
Ryan Schultz (Reg. No. 65,134) ROBINS KAPLAN LLP 800 LaSalle Avenue 2800 LaSalle Plaza Minneapolis, MN 55402 612.349.8408 (telephone) 612.339.4181 (fax) RSchultz@robinskaplan.com	Ari B. Lukoff (Reg. No. 71,508) ROBINS KAPLAN LLP 800 LaSalle Avenue 2800 LaSalle Plaza Minneapolis, MN 55402 612.349.8781 (telephone) 612.339.4181 (fax) Alukoff@robinskaplan.com Christopher K. Larus ROBINS KAPLAN LLP 800 LaSalle Avenue 2800 LaSalle Plaza Minneapolis, MN 55402 612.349.0116 (telephone) 612.339.4181 (fax) CLarus@robinskaplan.com

Please direct all correspondence regarding this Petition to lead counsel at the above address. Petitioners consent to service by e-mail at the e-mail addresses listed above.

XVI. GROUNDS FOR STANDING

Petitioner certifies that (1) the '842 Patent is available for IPR, (2) Petitioner is not the Patent Owner, and (3) it is not barred or estopped from requesting IPR of the '842 Patent. The Petitioner has not initiated a civil action challenging the validity of the '842 Patent.

Dated: August 15, 2018

Respectfully submitted,

By: /Ryan M. Schultz/

Ryan M. Schultz (Reg. No. 65,134)
Robins Kaplan LLP

*Attorney for Petitioner The Sherwin-Williams
Company*

CERTIFICATION UNDER 37 CFR § 42.24(D)

Pursuant to 37 C.F.R. § 42.24(d), I certify that this petition complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1)(i) because it contains 13,994 words, excluding the parts of this petition that are exempted by 37 C.F.R. § 42.24(a), according to the word-processing system used to prepare this petition.

/Ryan M. Schultz/

Ryan M. Schultz

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.105, the undersigned certifies that on August 16, 2019, a copy of the foregoing Corrected Petition and supporting materials was served in its entirety by Fedex on Patent Owner Arch Chemicals, Inc. by service on the following attorney of record:

Anand Patel
Dority & Manning, P.A.
Post Office Box 1449
Greenville, SC 29602-1449

Courtesy copies were also sent to counsel for Patent Owner at the following address:

Anne Li
Crowell and Moring
590 Madison Avenue, 20th Floor
New York, NY 10022-2544
ali@crowell.com

Dated: August 16, 2019

Respectfully submitted,

/Ryan M. Schultz/

Ryan M. Schultz
Reg. No. 65,134
Robins Kaplan LLP
2800 LaSalle Plaza
800 LaSalle Avenue
Minneapolis, MN 55402

Attorney for Petitioner