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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/870,232	04/25/2013	Roderick D. Herdman	2156-695A (IS)	3079
159237	7590	02/26/2020	EXAMINER	
MacDermid Performance Solutions - Patents c/o Carmody Torrance Sandak & Hennessey LLP 195 Church Street P.O. Box 1950 New Haven, CT 06509-1950			PHASGE, ARUN S	
			ART UNIT	PAPER NUMBER
			1795	
			NOTIFICATION DATE	DELIVERY MODE
			02/26/2020	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* RODERICK D. HERDMAN

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Appeal 2018-002039  
Application 13/870,232  
Technology Center 1700

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Before ROMULO H. DELMENDO, BEVERLY A. FRANKLIN, and  
SHELDON M. MCGEE, *Administrative Patent Judges*.

MCGEE, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the Examiner's decision to reject claims 1–17. An oral hearing was conducted on February 13, 2020.

We have jurisdiction. 35 U.S.C. § 6(b).

We affirm.

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<sup>1</sup> We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as MacDermid Acumen, Inc. Appeal Br. 2.

## BACKGROUND

The subject matter on appeal is directed to solutions to be used in etching plastics so that the plastic may be plated with a metal for, e.g., decorative or electronic use. Spec. 1:10–18. Plastics such as acrylonitrile/butadiene/styrene polymer, i.e., “ABS” polymer “is etched almost exclusively using a mixture of chromic and sulfuric acids,” but because “chromic acid is a recognized carcinogen and is increasingly regulated,” alternatives are sought. *Id.* at 2:3–29.

One such alternative is an etching solution comprising trivalent manganese ions, i.e., Mn(III), in a strong acid such as sulfuric acid. *Id.* at 3:13–25. Because “trivalent manganese is unstable and is highly oxidizing,” “it very rapidly disproportionates to manganese dioxide and divalent manganese” [Mn(II)] in solution. *Id.* at 3:15–18. “[I]n strong sulfuric acid solutions, trivalent manganese ions become meta-stable,” thus providing “a suitable medium for etching of ABS” with purported advantages over other chromium-free etching solutions. *Id.* at 3:22–25. “[B]ecause the solution is based on very strong sulfuric acid, [it tends] to absorb water, which destabilizes the manganese (III) ions, causing them to disproportionate into manganese dioxide and manganese (II) ions,” thus leading to the formation of manganese dioxide sludge. *Id.* at 3:26–4:2.

The claimed method seeks to solve the manganese dioxide sludge generation problem. *Id.* at 4:4–6, 15–24.

Sole independent claim 1, reproduced below, is illustrative:

1. A method of regenerating an etch solution comprising a metastable complex of manganese(III) ions in a strong acid, wherein at least a portion of the manganese(III) ions have been destabilized, causing them to disproportionate into manganese

dioxide and manganese(II) ions, the method comprising the steps of:

- a. adding an effective amount of a reducing agent for the Mn(IV) of the manganese dioxide to the etch solution;
- b. allowing the reducing agent to react with the etch solution to cause the Mn(IV) in the manganese dioxide to be reduced to Mn(II) and to dissolve; and
- c. applying an electrical current through an anode and a cathode in the etch solution to regenerate manganese(III) ions in the etch solution from manganese(II) ions.

#### REFERENCES

The Examiner relies on the following prior art:

Name	Reference	Date
Parsons	US 2,739,869	Mar. 27, 1956
De Boer	US 7,056,424 B2	June 6, 2006
Schildmann	WO 2009/023628 A2	Feb. 19, 2009

#### REJECTIONS

On appeal, the Examiner maintains the following rejections under 35 U.S.C. § 103:

- I. Claims 1–14 over Schildmann in view of Parsons; and
- II. Claims 15–17 over Schildmann and Parsons in view of De Boer.

Ans. 2. The rejections listed in the Final Office Action dated January 30, 2017 but not listed above were withdrawn by the Examiner in the Answer and are not before us. *See id.*

#### DISCUSSION

For Rejection I, Appellant separately argues claims 1, 4, 7, and 9. Appeal Br. 3–7. For claim 5, Appellant relies on the argument presented for claim 4, and for claim 8, Appellant relies on the argument presented for

claim 7. *Id.* at 6–7. For Rejection II, Appellant relies on the arguments presented for claim 1. *Id.* at 8. We address the claims separately to the extent they are so argued by Appellant consistent with 37 C.F.R. § 41.37(c)(1)(iv) (2017).

*Claims 1–3, 6, and 10–17*

In rejecting claim 1, the Examiner finds that Schildmann discloses the claimed method. Final Act. 2 (citing Schildmann ¶¶ 19–21). Appellant’s arguments are set forth on pages 5 and 6 of the Appeal Brief. We find these arguments unpersuasive of reversible error in the rejection, and sustain the Examiner’s rejection of these claims for the reasons provided by the Examiner in the Final Office Action, the Answer, and below.

Appellant argues that step (c) of the claimed method is not disclosed by the cited prior art. Appeal Br. 5. Specifically, Appellant urges that Parsons is directed to a reduction reaction, i.e., it does not “regenerate” ions, and that Schildmann “goes too far in its oxidation” by oxidizing Mn(II) to Mn(VII). *Id.* This argument is unpersuasive because Appellant does not attempt to distinguish the regeneration of “manganese(III) ions in the etch solution from manganese(II) ions” recited in claim 1 over the process disclosed in Schildmann. Indeed, Schildmann discloses preparing a manganese ion containing solution “by dissolving or dispersing a suitable manganese salt in an acid solution.” Schildmann ¶ 19. Such suitable manganese salts include manganese(II) salts such as manganese carbonate (MnCO<sub>3</sub>) and manganese sulfate (MnSO<sub>4</sub>), and the acid solution can include sulfuric acid, phosphoric acid, or mixtures thereof. *Id.* ¶¶ 19–20. That solution, containing acid and a suitable manganese salt having an oxidation state lower than +7, undergoes “anodic oxidation inside an oxidation cell” to

obtain manganese ions at an oxidation state of +7. *Id.* ¶ 19. The oxidation cell “includes an anode space and a cathode space which are separated from each other through a diaphragm or a membrane correspondingly allowing ions to pass through.” *Id.* ¶ 21. An electrical current of a given current density is applied. *Id.* ¶¶ 23–24. Moreover, as found by the Examiner (Final Act. 9), Schildmann discloses “the fact that manganese occurs in all oxidation stages between +2 and +7,” and that anodic oxidation is a progressive process. *Id.* ¶ 27.<sup>2</sup> Therefore, while Schildmann does not expressly state that its manganese(II) ions oxidize to “regenerate” manganese(III) ions during the process of producing manganese ions of an even higher oxidation state, e.g., Mn(VII), the skilled artisan would have understood that oxidation—being a progressive process as disclosed by Schildmann—would have resulted in oxidation of Mn(II) into Mn(III) before even higher oxidation states are achieved. *Id.*; *see also* Ans. 6 (explaining how the manganese oxidation states from +2 to +7 is “a continuum”).

Because of the substantial similarities between Schildmann’s process and that of Appellant, we are not persuaded by Appellant’s argument (Appeal Br. 5; Reply Br. 4) that Schildmann does not disclose the claimed “etch solution comprising a metastable complex of manganese(III) ions in a

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<sup>2</sup> Appellant does not challenge this finding in the Appeal Brief, but appears to present a new argument regarding this finding in the Reply Brief at page 4. We do not consider this new argument as Appellant does not demonstrate that good cause exists to warrant consideration of this belated argument. 37 C.F.R. § 41.41(b)(2). Even if we were to consider this argument, we disagree with Appellant’s interpretation of Schildmann’s ¶ 27 because it makes clear that it is a “*fact* that the manganese occurs in all oxidation stages between +2 and +7,” not an “assumption” as argued by Appellant. Schildmann ¶ 27 (emphasis added).

strong acid.” Here, Appellant’s disclosure teaches how, “in a strong sulfuric acid solution, the trivalent manganese ion becomes meta-stable,” and that such trivalent manganese ions “are formed from Mn(II).” Spec. 5:18–19, 24–26. Disclosed sources of Mn(II) ions include manganese sulfate and manganese carbonate. *Id.* at 6:26–28. “Manganese(III) ions can be conveniently generated by electrochemical means by the oxidation of manganese(II) ions.” *Id.* at 7:3–4; *see also id.* at 9:15–21 (Example 1 setting forth how a solution of manganese sulfate and sulfuric acid was electrolyzed “at low anodic current density” to form a “manganese(III) complex”); *id.* at 10:20–25 (Example 2 setting forth identical reactants and reaction conditions as Example 1). Similarly, Schildmann teaches providing a source of manganese ions, e.g., Mn(II), in the form of manganese carbonate (MnCO<sub>3</sub>) or manganese sulfate (MnSO<sub>4</sub>) and dissolving it in an acid such as sulfuric acid. Schildmann ¶¶ 19–20. Those Mn(II) ions are then oxidized in an oxidation cell. *Id.* ¶ 21. Therefore, because Schildmann teaches the same components (e.g., magnesium sulfate, sulfuric acid) apparently undergoing the same reaction conditions (anodic oxidation)—which the disclosure teaches forms a manganese(III) complex—it is Appellant’s burden to come forth with evidence demonstrating Schildmann does not form a metastable complex of Mn(III) ions for this line of argument to be persuasive. *See In re Best*, 562 F.2d 1252, 1255 (CCPA 1977) (stating

[w]here, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. Whether the rejection is based on ‘inherency’ under 35 U.S.C. § 102, on ‘prima facie obviousness’ under 35 U.S.C. § 103,

jointly or alternatively, the burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products.

(citations and footnote omitted)). On this record, Appellant has failed to do so. Accordingly, Appellant's argument (Appeal Br. 5) that Schildmann did not "appreciate the formation of the 'metastable' Mn (III) complex" is unavailing. *See Verdegaaal Bros., Inc. v. Union Oil Co. of Calif.*, 814 F.2d 628, 633 (Fed. Cir. 1987) (explaining how discovery of a property inherent to a prior art process does not render that process patentable even if the prior art did not appreciate that property); *see also MEHL/Biophile Int'l Corp. v. Milgraum*, 192 F.3d 1362, 1366 (Fed. Cir. 1999) ("[w]here, as here, the result is a necessary consequence of what was deliberately intended, it is of no import that the article's authors did not appreciate the results").

Appellant also argues that Schildmann's manganese(III) can only be generated in the form of an insoluble salt, and, thus does not create the claimed "metastable complex of manganese (III) ions in a strong acid." Appeal Br. 5. We are not persuaded by this argument. The portion of Schildmann to which Appellant refers expressly states when sulfuric acid is used as the pickling solution acid, "the formation of insoluble Mn(III) compounds *is avoided*." Schildmann ¶ 29 (emphasis added). In other words, contrary to Appellant's argument, there are times when manganese(III) is *not* formed as an insoluble compound. *See also* Ans. 4 (explaining how Schildmann "is disclosing that the use of the preferred acid would prevent the formation of 'insoluble' Mn(III) compounds.").

Appellant's other arguments regarding the combination of Schildmann and Parsons are unpersuasive because they appear to be based on a misunderstanding of the underlying rejection. Appeal Br. 5–6. In

particular, the Examiner does not state that the skilled artisan would have replaced Schildmann's acid dissolution mechanism in favor of Parson's reducing agent mechanism. Rather, the Examiner finds that Schildmann itself discloses "that it is known in the art to use the same reducing agents as presently claimed at stoichiometric rates to solubilize the insoluble manganese compounds." Final Act. 2 (citing Schildmann ¶ 33). We find no fault in the Examiner's finding because Schildmann teaches the claimed reducing agents (*see* claim 2, oxalic acid and hydrogen peroxide) being used to convert a non-soluble Mn(III) phosphate compound into soluble Mn(II). Schildmann ¶¶ 33–34. Based on this disclosure, the skilled artisan would have recognized that such reducing agents are useful for reducing *other* insoluble manganese compounds at *other* oxidative states, e.g., manganese dioxide at Mn(IV) as recited in claim 1. Parsons appears to be further evidence of the ability of hydrogen peroxide and oxalic acid to "have a reducing effect on MnO<sub>2</sub>." Parsons 4:3–14.

We also discern no persuasive merit in Appellant's argument that neither Schildmann nor Parsons "teach[es] the use of reducing agents to *regenerate* an etch solution after it is created." Appeal Br. 6. The claim recites no such requirement because step (c) makes clear that it is the electric current applied through the acidic etch solution that accomplishes the regeneration of Mn(III) ions. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) ("[A]ppellant's arguments fail from the outset because . . . they are not based on limitations appearing in the claims."); *see also* Ans. 7 (explaining how the claimed invention also does not regenerate Mn(III) ions by using a reducing agent but rather accomplishes this through electrolysis).

Finally, we note that many of the arguments presented in the Reply Brief are new arguments that were not raised in the Appeal Brief, nor appear to be responsive to an argument raised in the Examiner's Answer. *See* Reply Br. 5–6 (arguing no teaching of the “destabilized” and “disproportionate” limitations, and no teaching of steps (a) and (b) of the claimed method); *see also id.* at 6–7 (arguing hindsight). Appellant has not shown good cause why such arguments should be considered, so we do not consider them. 37 C.F.R § 41.41(b)(2).

*Claims 4 and 5*

Claims 4 and 5 depend ultimately from claim 1 and recite specific ranges of the reducing agent hydrogen peroxide. Appeal Br. 12. Appellant argues that the cited prior art—in particular, Parsons—does not teach the claimed range of the hydrogen peroxide reducing agent. Appeal Br. 7. This argument is not persuasive because it does not squarely address the Schildmann reference or the totality of the rejection as set forth by the Examiner. Final Act. 2–3. Specifically, the Examiner finds that Schildmann discloses using reducing agents at stoichiometric rates to solubilize insoluble manganese compounds. *Id.* at 2. Based on this disclosure, the Examiner determines the skilled artisan would have been motivated to modify Schildmann “to optimize the dissolution of the insoluble compounds.” *Id.* at 3; *see also* Ans. 8 (“One having ordinary skill in the art would have been led by this teaching to optimize the amount needed to obtain the desired magnesium ions in solution.”). Here, Appellant does not address, and therefore does not reveal error in, the Examiner's optimization theory, or the obviousness conclusion based thereon.

*Claims 7 and 8*

Claims 7 and 8 depend ultimately from claim 1 and recite specific ranges of the reducing agent oxalic acid or formic acid. Appeal Br. 12. As with claims 4 and 5, Appellant argues that the relied-upon prior art does not disclose the claimed range of oxalic acid, again focusing on the specific disclosure of Parsons. Appeal Br. 7. As we found with respect to claims 4 and 5, this argument does not address the Schildmann reference relied on by the Examiner with any degree of specificity. Nor does it squarely address the Examiner's determination that the skilled artisan would have been motivated to modify Schildmann's disclosure "to optimize the dissolution of insoluble compounds." Final Act. 3; *see also* Ans. 8 ("One having ordinary skill in the art would have been led by this teaching to optimize the amount needed to obtain the desired magnesium ions in solution."). Such arguments that do not address the rejection in full do not persuade us of reversible error.

*Claim 9*

Claim 9 depends from claim 1 and requires the reducing agent to be added in a stepwise fashion. Appeal Br. 12. Appellant argues that the cited prior art fails to disclose such an "iterative process of adding the reducing agent." *Id.* at 7. As with the other separately argued dependent claims, this argument fails to address the totality of the Examiner's reasoning (Final Act. 2-3), and therefore fails to identify reversible error in the Examiner's obviousness conclusion.

CONCLUSION

The Examiner's rejections are affirmed.

DECISION SUMMARY

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>References</b>	<b>Affirmed</b>	<b>Reversed</b>
1-14	103	Schildmann, Parsons	1-14	
15-17	103	Schildmann, Parsons, De Boer	15-17	
<b>Overall Outcome</b>			1-17	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED