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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE
THE PATENT TRIAL AND APPEAL BOARD

Ex parte JAMES W. KAUFFMAN,¹
Wugeng Liang, Lixia Cai, and Joseph Linzer²

Appeal 2015-003816
Application 12/712,481
Technology Center 1700

Before ADRIENE LEPIANE HANLON, MARK NAGUMO, and
JULIA HEANEY, *Administrative Patent Judges*.

NAGUMO, *Administrative Patent Judge*.

DECISION ON APPEAL

James W. Kauffman, Wugeng Liang, Lixia Cai, and Joseph Linzer (“SABIC”) timely appeal under 35 U.S.C. § 134(a) from the Final Rejection³ of claims 1–27 and 29–34, which are all of the pending claims. We have jurisdiction. 35 U.S.C. § 6. We affirm-in-part, but, because we rely on findings not made by the Examiner, we designate our affirmance a

¹ The real party in interest is identified as Saudi Basic Industries Corporation (“SABIC”). (Appeal Brief, filed 10 September 2014 (“Br.”), 2.)

² Rule 1.47. (Petition Decision 9 Nov 2010.)

³ Office action mailed 10 April 2014 (“Final Rejection”; cited as “FR”).

new ground of rejection in order to provide SABIC a full and fair opportunity to respond.

OPINION

A. Introduction⁴

The subject matter on appeal relates to heteropoly acid compounds that catalyze the vapor-phase oxidation of unsaturated aldehydes, such as methacrolein [$\text{H}_2\text{C}=\text{C}(\text{CH}_3)\text{C}(\text{O})\text{H}$] to unsaturated carboxylic acids, such as methacrylic acid [$\text{H}_2\text{C}=\text{C}(\text{CH}_3)\text{C}(\text{O})(\text{OH})$]. (Spec. 1, ll. 7–9.) The '481 Specification explains that “heteropoly acid compounds have a central metal atom surrounded by a framework of other metal atoms connected to each other and the central metal atom through oxygen atoms,” and that “[t]he central metal atom is different (‘hetero’) from the framework metal atoms.” (*Id.* at ll. 13–15.) According to the Specification, it is thought that the catalytic reaction “is a redox mechanism in which the methacrolein is oxidized by abstracting an oxygen atom which reduces Mo in the keggin structure of the heteropoly acid compound catalyst. If Mo is not in its highest oxidation state, the activity of the catalyst would be reduced.” (Spec. 8, l. 18, to 9, l. 3.)

During preparation of the catalyst, all of the component compounds are said to be in their highest oxidation state, except for antimony, which is in the 3+ state, rather than in the 5+ state. (*Id.* at 3, l. 10–11.) The inventors report the discovery that there is a relation between the oxidation states of

⁴ Application 12/712,481 *Method of making heteropoly acid compound catalysts*, filed 25 February 2010. We refer to the “'481 Specification,” which we cite as “Spec.”

molybdenum (Mo) and antimony (Sb) that affects the activity and stability of the catalysts. (*Id.* at 2, ll. 10–13.) In particular, Sb(3+) may reduce Mo(6+), which diminishes the amount of Mo(6+) and thus diminishes the reactivity of the catalyst. (*Id.* at 9, ll. 5–6.) Concomitantly, the amount of Sb(3+) is diminished (it is oxidized to Sb(5+)). As a result, the remaining catalyst is not subject to as much Mo reduction, i.e., it is more stable.

(*Id.* at ll. 6–7.) The Specification teaches that the activity of the catalyst can be restored by reoxidizing Mo not in its highest oxidation state to its highest state by “air oxidation, air-liquid and/or air-solid contact, during catalyst synthesis of the solutions [a)]/slurries [b)] of the component compounds, during removal of the liquid [c)] and drying [d)] the solid precipitate and during calcination [f)].” (*Id.* at ll. 8–10; square-bracketed labels to steps recited in claim 1, reproduced *infra*, added.) The Specification also shows that “[a)]though a higher relative activity is attained by using the fully oxidized antimony pentoxide the relative selectivity^[5] was not as high as when the starting reagent is antimony (3+) trioxide. In other words, antimony (3+) trioxide must be used to attain the highest selectivity.”

(*Id.* at 28, ll. 16–19.) Thus, control of the Mo oxidation state offers the opportunity to optimize catalyst performance. Indeed, according to the Specification, “[i)]f oxidation is not complete in one stage, it can not be compensated for in a later stage, so the final activity of the catalyst depends

⁵ The Specification states that “Relative Selectivity means the difference in percent selectivity between the sample catalyst minus the percent selectivity of the reference catalyst” (Spec. 15, ll. 11–12), but does not define the term “selectivity.” An apparently consistent definition is provided by Noh (full cite at n. 9, *infra*): “methacrylic acid selectivity (%) = [mol number of generated methacrylic acid/mol number of reacted methacrolein] × 100.” (Noh, 3 [0071].)

on the effectiveness of oxidation during each of the synthesis, drying, and calcination stages.” (*Id.* at 8, ll. 7–9.)

Claim 1 is representative and reads:

A process for preparing a heteropoly acid compound catalyst comprising:

- a) adding a molybdenum compound, vanadium compound, phosphorus compound, bismuth compound, copper compound, boron compound, and cesium compound to water and/or acid, and adding an antimony compound to form a composition comprising molybdenum; wherein the molybdenum is at its highest oxidation state, and antimony has a 3+ oxidation state in the composition;
- b) precipitating a catalyst precursor solid from the composition to form a slurry;
- c) separating the solid from liquid of the slurry;
- d) drying the solid;
- e) forming the solid;
- f) calcining the solid to form a heteropoly acid compound catalyst; and
- g) between steps a) and f), subjecting the molybdenum to oxidative conditions.

(Claims App., Br. 22; some indentation, paragraphing, and emphasis added.)

It may be noted that condition g) requires that in at least one of steps b) through e), or before or after any of these steps, the molybdenum in the catalyst precursor solid is subjected to “oxidative conditions.”

Remaining independent claim 33 (*id.* at 27) and its dependent claim 34 are similar to claim 1 and are not argued separately.

The Examiner maintains the following grounds of rejection⁶:

- A. Claims 1–11, 14, 16–19, and 21–27,⁷ and 29–34 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Stevenson⁸ and Davis.⁹
- A1. Claims 12, 13, 15, and 32 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Stevenson, Davis, and Noh.¹⁰
- A2. Claims 20 and 22 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Stevenson, Davis, and Kauffman.¹¹

⁶ Examiner’s Answer mailed 13 January 2015 (“Ans.”).

⁷ The Examiner’s inclusion of canceled claim 28 in the statement of the rejection (FR 2) appears to be a harmless oversight.

⁸ Scott A. Stevenson et al., *Catalyst for methacrolein oxidation and method for making and using same*, U.S. Patent No. 7,732,367 B2 (2010) (all present inventors are among the co-inventors listed on Stevenson, which is assigned to Saudi Basic Indus. Corp., the real-party-in-interest in the present appeal), based on an application filed 25 July 2005.

⁹ Mark E. Davis et al., *Polyoxometallate catalysts and catalytic processes*, U.S. Patent No. 6,914,029 B2 (2005).

¹⁰ Hyun-Kuk Noh et al., *Method of preparing heteropoly acid catalyst*, U.S. Patent Application Publication 2010/0184591 A1 (2010), based on an application filed 13 June 2008.

¹¹ James W. Kauffman, Lixia Cai, and Wugeng Liang, *Process for synthesizing a heteropoly acid catalyst for oxidation of unsaturated aldehydes to unsaturated carboxylic acid*, U.S. Patent No. 7,485,596 B2 (3 February 2009) (assigned to Saudi Basic Indus. Corp., the real-party-in-interest in the present appeal.).

B. Discussion

Findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

Rejection A1: claim 1

SABIC focuses its arguments on independent claim 1, with further specific arguments directed to certain dependent claims, as discussed *infra*.

Briefly, the Examiner finds that Stevenson, in Example 1 (Stevenson, col. 18), and in the background, although “silent about keeping the framework metal atoms (Mo, Va [sic: V], P, Bi, Cu, B, and Cs[]) at highest oxidations state” (FR 4, ll. 11–12), specifies that the metals are added as salts in their highest oxidation state, and therefor “indirectly prefer[s] that Mo is at its highest oxidation state” (*id.* at ll. 15–16). The Examiner finds further that Davis provides, in the background of the disclosure, teachings (Pope) that framework metal atoms, especially Mo, V, or W at cation valences of four to six “apparently permit these metals to form stable heteropolyacids and polyoxyometallates.” (*Id.* at ll. 17–21, quoting Davis, col. 3, ll. 43–45.) The Examiner concludes that “[a]s air and oxidizing agent are used while soaking, drying and calcining, it would be obvious that the Mo is reoxidizing during and after the dissolving step.” (FR 5, ll. 11–13.)

In particular, SABIC urges that, as illustrated by Table A (Br. 9), “Stevenson fails to disclose or suggest that their adding, evaporating, drying, or sieving is done in the presence of air.” (*Id.* at ll. 2–3.) Nor, in SABIC’s view, does Stevenson “even mention the oxidation state of the molybdenum compound.” (*Id.* at 11–12.) SABIC urges that the only steps during which Stevenson mentions air are the “soak,” which SABIC characterizes as part of

the calcination protocol¹² and the calcining itself. (*Id.* at 9, Table A, and para. bridging 9–10.) SABIC emphasizes that Stevenson designs these steps to optimize pore size in the heteropoly acid compound catalysts, “and fail[s] to even suggest that their molybdenum is being reoxidized in their calcination step.” (*Id.* at 10, ll. 16–20.) SABIC concludes that these references provide no motivation to subject molybdenum to oxidizing conditions between steps a) and f). (*Id.* at 10, ll. 21–23.)

Review of Stevenson, Example 1, and the background, confirms the silence of Stevenson regarding the atmospheric conditions under which the catalyst synthesis occurs. And while we would be reluctant to accord much weight to the mere silence of Stevenson regarding the conditions under which the aqueous solutions of the metal salts are prepared, filtered, and dried, there being no indications that oxygen-free conditions should be used, we find in Stevenson no positive teachings that the preparation, separation, and drying are conducted with exposure to the ambient workplace atmosphere. Similarly, we find the conditions under which the catalyst is used (i.e., in the presence of oxygen) not inconsistent with the conclusion that the preparation of the catalyst precursors would be conducted, reasonably, without special precautions to provide an oxygen-free environment. Nonetheless, in light of SABIC’s objection that Stevenson provides no such positive teachings, we hold that the Examiner had the burden of coming forward with evidence supporting the implicit “Official

¹² This characterization is consistent with SABIC’s disclosure that the calcination can proceed in two steps: step one, at 150–300°C for 1–5 hours; step two, at 300–400°C for 4–8 hours. (Spec. 7, ll. 15–16.)

Notice” taken that these steps could be conducted with exposure to the ambient atmosphere. This the Examiner failed to do.

It turns out, however, that we need look no further than Kauffman, applied against claims 20 and 22 in Rejection A2, for a teaching that, in a “process for synthesizing heteropoly acid catalyst for oxidation of unsaturated aldehydes to unsaturated carboxylic acid” (Kauffman, title), “[d]rying of the catalyst precursor may be *in air* or an inert gas and in an oven, a spray dryer or other suitable drying equipment as known in the art. *Preferably, drying is in an oven in air[.]*” (Kauffman, col. 4, ll. 25–28; emphasis added.)¹³ Thus, Kauffman instructs that a step corresponding to step d) of process claim 1 is preferentially carried out in air.

For completeness, we make Onoda¹⁴ of record.¹⁵ Onoda teaches that “heteropoly-acids suitable for use as a component of a variety of oxidation catalysts” (Onoda, abstract) are prepared from aqueous slurries of raw materials—specifically, oxides or oxyacids of molybdenum, vanadium, phosphurs, and tungsten (*id.* at col. 1, ll. 50–52). Onoda teaches that “[t]he hydrothermal reaction of the aqueous slurry may be carried out *in a manner known per se, usually in an oxidizing atmosphere using air, oxygen, etc.*” (Onoda, col. 3, ll. 10–12; emphasis added.)

¹³ Although Kauffman was not applied against claim 1, because Kauffman (and Stevenson) share common inventors with the appealed application, and because all three documents are concerned with heteropolyacid catalysts of the same family, if not identical compounds, we are surprised that SABIC did not clarify this issue *sua sponte*.

¹⁴ Takeru Onoda and Masayuki Otake, *Process for preparing heteropoly-acids*, U.S. Patent No. 4,146,574 (1979).

¹⁵ See form PTO-892, mailed with this Opinion.

It is apparent that reaction steps a), b) and d) of claim 1 are conducted, typically, in contact with the ambient air. It follows that, absent compelling reasons, the routineer also likely would have conducted the steps c) (separating the solid from the liquid) and e) (forming the solid) in air, for convenience.

Moreover, the '481 Specification indicates that no special conditions are needed to provide the "oxidative conditions" for the reoxidation of the molybdenum:

Air can be introduced to the solution/slurry during catalyst synthesis, e.g., air sparging. An oxidizing agent, such as hydrogen peroxide, nitrous oxide, nitrogen oxide, nitric oxide or mixtures or combinations, can be introduced into the solutions/slurries of the catalyst synthesis. The solid precipitate is dried in an oxygen environment, e.g., air, mixture of oxygen with inert gas, etc.

(Spec. 9, ll. 10–14.) See also the "Synthesis of HPA catalyst" (Spec. 14, l. 5, to 15, l. 2.) It follows that the condition of "subjecting the molybdenum to oxidative conditions" may be accomplished by performing these reactions in contact with air.

Furthermore, the record indicates that the stage at which the precipitation occurs is not particularly important, although the performance of the catalyst may be affected. The Specification reveals, for example, that:

[t]he present invention does not depend on a particular order of addition of the components. While a particular order of addition of the various metal compound components may affect the performance of the catalyst, the present invention is directed toward the particular oxidation state of certain components without regard to the order in which the steps in the process of making the catalyst occur.

(Spec. 6, ll. 12–16.)

In particular, the Specification indicates precipitation occurs upon addition of dissolved cerium nitrate. (Spec. 6, ll. 19–20.) In contrast, Stevenson indicates precipitation was induced upon addition of bismuth solution (Stevenson, col. 10, ll. 50–52; Kauffman, col. 3), but is not particularly concerned with the state of the added materials (*id.* at l. 60, to col. 11, l. 1.) Consistently, Kauffman teaches that

[p]recipitation may occur spontaneously as the compounds are mixed together in solution or it may be promoted by heating, cooling or other changes in ambient conditions or by adding a material which will act as a nucleus or “seed” for precipitation of particles. This “seed” material can be a compound containing one or more of the elements of the catalyst composition.

(Kauffman, col. 3, ll. 27–34.)

Accordingly, we conclude that the burden is on SABIC to show that a person having ordinary skill in the art would have understood that the step of precipitating the catalyst precursor solid would not have been performed in air; alternatively, that those steps would not have been sufficient to provide “oxidative conditions” as specified in claim 1. *See, e.g., In re Best*, 562 F.2d 1252, 1255 (CCPA 1977) (“This burden [that the applicant prove that the subject matter shown to be in the prior art does not possess the characteristic relied on] . . . is applicable to product and process claims reasonably considered as possessing the allegedly inherent characteristics.”).

SABIC has not carried its burden of production or persuasion on these matters, with one salient exception, namely the meaning of the “soak” step described by Stevenson (Stevenson, col. 18, ll. 56–59 (Example 1)). The Examiner appears to find that the “soak” step refers to a treatment of the slurry, rather than an initial part of the calcination. (FR 4, ll. 12–14; Ans. 9,

ll. 10–12.) No substantial evidence supports the Examiner’s findings regarding this interpretation of the term “soak.” Stevenson teaches that the slurry is evaporated at about 75°C to about 100°C to form an evaporated mixture, which was then dried at about 130°C for about 16 hours, sieved, and then heated to a soak temperature of 230°C at a rate of 0.5°C/min and held there for 3 hours in air. (Stevenson, col. 18, ll. 52–56.) The Examiner has offered no explanation of how this soaking step would have been understood by the artisan as referring to any step of treatment of the slurry.

Nonetheless, the weight of the evidence regarding the precipitation of the slurry, the separation of the precipitate from the liquid, the drying, and the forming, is that these steps would have been understood to be performed in the ambient atmosphere, i.e., in air. We have considered SABIC’s argument that the Examiner failed to come forward with evidence of this fact, but we find work reported in the record by the present inventors, as well as by Onoda, a lead reference in the area of heteropoly acid compounds, fully supports the Examiner’s inferences and quasi-Official Notice.

Accordingly, we affirm the rejection of claim 1, but we designate this affirmance a new ground of rejection.

Claims 6–10 and 14¹⁶

Claim 6 depends from claim 1 and requires that:

the molybdenum is reoxidized by air oxidation *by air-liquid and/or air-solid contact* in one or more of the following in the slurry [b)], during the separating of the solid from the liquid of the slurry [c)], and during drying the solid [d)].

¹⁶ (Br. 13–15.)

(Claims App., Br. 23–24; indentation, paragraphing, bracketed labels to steps recited in claim 1, and emphasis added.)

In light of the immediately preceding findings regarding Kauffman (drying) and Onoda (slurry), claim 6, as well as claim 7, which depends from claim 6 and which further requires that “air is introduced to the slurry” (Claims App., Br. 24), and claim 14, which depends from claim 6, and which requires that “the solid is dried in air” (*id.* at 25), we affirm, also as a new ground, the rejection of claims 6 and 7.

Claim 8 depends from claim 1 and requires that “an oxidizing agent is introduced *into* the slurry” (*id.* at 24, emphasis added). Such an introduction requires more than merely exposing the surface of the slurry to the air, as recited in claims 6 and 7. In other words, air must be, for example, sparged into the slurry (or the slurry agitated or shaken with such vigor that air is entrained into the slurry). The Examiner has not directed our attention to evidence in the present record showing that sparging or such agitation would have been suggested by the prior art. Accordingly, we reverse the rejection of claim 8 and of claim 9, which depends from claim 8.

Claim 10 depends from claim 6, and requires that “the slurry is aged for more than 3 hours and the solid is reoxidized during drying.” (*Id.* at 24.) Although Kauffman indicates that drying in air is preferred, and the burden of rebutting the presumably inherent oxidation of the solid has not been carried by SABIC, the Examiner has not directed our attention to any credible evidence in the record regarding the aging of the slurry. Accordingly, we reverse the rejection of claim 10.

Claims 16–19¹⁷

Claim 16 depends from claim 6 and specifies further that the solid has a lubricant level of at least about 4.4 wt%. The Specification explains that the presence of a lubricant is thought to “keep the tablet porosity sufficiently high enough to allow re-oxidation of the catalyst in the process.” (Spec. 27, ll. 7–8.) Graphite and water are identified as suitable lubricants. (*Id.* at 28, Table VIII; and at 34, original claim 17.) Claims 17–19 depend from claim 16 and specify the lubricant, minimum crush strength, and maximum green tab density. The Examiner finds that because the formula of the heteropoly acid compound catalyst obvious in view of Stevenson and Davis is the same as that recited in the claim, “Stevenson’s catalyst in example 1 would have a lubricant level of at least 4.4%,” as well as the crush strength and green tab densities recited in claims 18 and 19. (FR, para. bridging pages 5–6.)

The difficulty with this finding is that the Examiner does not direct our attention to any disclosure in the prior art of record that teaches the presence of a lubricant, such as water or graphite.

We therefore reverse the rejection of claims 16–19.

Claims 23 and 24¹⁸

Claim 23 depends from claim 21, which depends from claim 6, which in turn depends from claim 1,¹⁹ and requires that the “calcination is in

¹⁷ (Br. 15–17.)

¹⁸ (Br. 17–18.)

¹⁹ The characterization by SABIC that claim 23 depends from claim 1 (Br. 17, l. 25) is true but incomplete.

enriched air.” (Claims App., Br. 26.) As SABIC urges, no substantial evidence in Stevenson or Davis supports the Examiner’s finding (FR 4, ll. 19–21) that Stevenson indicates that the calcination, which is said to occur in air, would be run to some advantage in [O₂]-enriched air. As SABIC points out (Br. 13, l. 28 to 14, l. 2), Stevenson discloses the use of pure oxygen during the use of the catalyst (Stevenson, col. 17, ll. 15–27), not during the making of the catalyst. The Examiner’s unsupported and unelaborated conclusions to the contrary do not suffice to establish a prima facie case of obviousness. We therefore reverse the rejection of claim 23.

Claim 24 depends from claim 1 and requires storing the catalyst in air or enriched air with a moisture content below 5% ambient at a temperature below 35°C and at a pressure greater than one atmosphere. SABIC contends that there is no disclosure in Stevenson or in Davis supporting the Examiner’s finding [FR 6, ll. 1–5] that the catalyst is easily reduced, and that it would have been obvious to store the catalyst under the recited conditions.

As “ordinary” as the recited conditions appear, the Examiner does not respond to SABIC’s criticisms (Ans.) by identifying any specific disclosure or general teaching in Stevenson or Davis that supports either the specific findings of fact made by the Examiner or the conclusions based on those findings. Such unelaborated findings, when challenged, do not suffice to establish a prima facie case of obviousness. We therefore reverse the rejection of claim 24.

Rejection A1: claims 12, 13, 15, and 32²⁰

Claims 12, 13, and 15 depend from claim 6, while claim 32 depends from claim 13. (Claims App., Br. 24, 25, and 27.) Claim 12 requires that the solid be separated from the liquid and dried by spray drying. Claim 13 requires that the solid be dried “in air in an oven or a spray dryer.” Claim 32 specifies that the oven be a circulating air oven, but does not require that drying be done in the oven. Thus, claim 32 requires that the solid be dried in air in a circulating air oven or a spray dryer. Claim 15 requires that the solid be dried in an oven in air at a specified temperature for a specified time.

Regarding claims 12 and 13, SABIC urges that “Noh merely describes that their reaction solvent can be evaporated from their heteropoly acid slurry by oven-drying, stirring-drying, or spray drying to give a powder. (Paragraph [0040])[.]” (Br. 18, ll. 19–21.) The Examiner’s rejection must be reversed, SABIC argues, because Noh does not teach or recognize advantages over evaporation in air, such as better control. (*Id.* at ll. 21–23.) SABIC urges further that documentary proof must be provided that an artisan would actually use spray drying to dry a heteropoly acid from a slurry (*Id.* at 19, ll. 3–4), and that they have “surprisingly found that spray drying the slurry after digestion has the benefit of allowing for better air-solid contact to oxidize the catalyst precursor giving a higher relative activity.” (*Id.* at ll. 6–8.)

These arguments are not persuasive of harmful error. With respect to claims 12, 13, and 15, Noh clearly discloses that “[t]he heteropoly acid slurry prepared in step (A) can be filtered, or evaporating a reaction solvent

²⁰ (Br. 18–19.)

therefrom by oven-drying, stirring-drying or spray drying to give powder.” (Noh 2 [0040].) SABIC has not explained why step d), “drying the solid,” would not be met by any of the alternatives recited in this disclosure, all of which are said to lead to a “powder.” Moreover, in claims 13 and 32, spray drying is merely an optional, alternative method of drying; oven drying remains a drying option within the scope of these claims.

As for the unexpected results urged for spray drying in claims 12 and 13, and for oven drying in claims 15 and 32, the evidence proffered (i.e., examples in the Specification) are not commensurate with the scope of exclusivity covered by the claims. This is true for the fundamental reason that claim 6, from which all these claims depend, directly or indirectly, requires that the molybdenum be reoxidized in any one of steps b), c), or d), whereas claims 12, 13, and 32 would be met by a process that does not result in molybdenum reoxidation during a spray-drying step as long as reoxidation were accomplished during one of steps b), c), or d). The limited showings in Examples 18–20 (Spec. 21–22) are insufficient to demonstrate unexpected results compared to the prior art methods.

SABIC’s arguments with respect to claims 12, 13, 15, and 32 are not persuasive of harmful error. However, given the evidentiary infirmities of the appealed rejection of claims 1 and 6, discussed *supra*, we denominate our affirmance of Rejection A1 of as a new ground of rejection.

Rejection A2: claims 20 and 22²¹

Claim 20 depends from claim 1 and requires that the solid be formed “at a pressure of 10,000 psi or less.” (Claims App., Br. 25.) SABIC urges that Kauffman “does not cure the deficiencies of Stevenson in view of Davis with respect to Claim 1.” (Br. 19, ll. 28–29.) However, as discussed *supra*, Kauffman, which shares common inventors with the application on appeal, expressly teaches oven-drying in air. SABIC does not challenge the Examiner’s findings regarding Kauffman and the further limitation recited in claim 20. We note in particular that forming at any pressure less than 10,000 psi (about 10,000 psi/15 psi/atm \approx 6,700 atm) would meet claim 20. On the present record, we therefore affirm Rejection A2 of claim 20.

Claim 22 depends from claim 21 and requires that “the solid is calcined in two stages with a first stage at a temperature of 150–300°C for 1–5 hours *before forming* and a second stage at a temperature of 300–400°C for 4–8 hours after forming.” (Claims App., Br. 26; emphasis added.) As SABIC urges (Br. 29), while Kauffman does disclose two stages, Kauffman does not disclose or suggest forming the catalyst between the two stages of calcination. The Examiner does not come forward with evidence or argument explaining why the artisan would have been motivated by teachings in the prior art to subject the catalyst to a forming step after the first stage of calcination. We therefore reverse Rejection A2 of claim 22.

²¹ (Br. 19–20.)

Residual claims

SABIC does not present arguments for the separate patentability of claims 2–5, 11, 14, 25–31, 33, and 34. Accordingly, these claims stand or fall with claim 1.

New Ground of Rejection

We might simply affirm Rejection A2 of claim 20, based on the reasoning *supra* at 17, attributing to SABIC full knowledge of the teachings of Kauffman regarding the drying of separated powders in an oven in air. However, it appears that the full scope of the claims to processes in this application has not been appreciated by either the Examiner or by SABIC. It also appears that the teachings of Kauffman have not been appreciated by SABIC or by the Examiner; and the necessity of citing teachings such as those of Onoda has not been appreciated.

To rectify these matters and to ensure that a *prima facie* case of obviousness of all aspects of the claimed subject matter thus far disputed is set out with respect to those rejections we affirm, we set out the following new grounds of rejection:

- B. Claims 1–7, 11–15, 20, 21, and 25–34 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Stevenson, Onoda, Kauffman, and Davis.
- B1. Claims 12, 13, 15, and 32 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Stevenson, Onoda, Kauffman, Davis, and Noh.

We leave to the sound discretion of the Examiner to determine whether dependent claims, the rejections of which we have reversed, would

have been obvious in view of the teachings of references of record or additional references as may be necessary.

C. Order

It is ORDERED that the rejection of claims 1–7, 11–15, 20, 21, 25–27 and 29–34 is affirmed as a new ground of rejection, as set forth *supra* at 18.

It is FURTHER ORDERED that the rejection of claims 8–10, 16–19, and 22–24 is reversed.

NEW GROUND OF REJECTION: 37 C.F.R. § 41.50(b)

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.50(b). 37 C.F.R. § 41.50(b) provides “[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review.” 37 C.F.R. § 41.50(b) also provides that the Appellants, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

(1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new Evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the prosecution will be remanded to the examiner. . . .

(2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same Record. . . .

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TIME PERIOD

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).

AFFIRMED-IN-PART; 37 C.F.R. § 41.50(b)