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usdocket@corning.com
STATEMENT OF THE CASE


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

We affirm in part.

CLAIMED SUBJECT MATTER

Appellant states the invention relates to a method of decreasing the concentration of impurities in silica soot, such as ZrO₂ and Cr₂O₃ particles. Spec. ¶ 2. Claims 4 and 14, reproduced below, are illustrative of the claimed subject matter (Appeal Br. 28–29, Claims Appendix):

4. A method of treating silica-based soot or an article comprising a silica-based soot layer, said method comprising:
   treating said silica-based soot or said article comprising a silica-based soot layer, said silica-based soot or said silica-based soot layer comprising Cr₂O₃, with:
   a mixture comprising CO, Cl₂, and a carrier gas at a treatment temperature between 900 °C and 1200 °C such that a total concentration of CO and Cl₂ in said mixture is greater than 10%, by volume, a ratio of CO:Cl₂ in said mixture is between

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1 This Decision includes citations to the following documents: Specification filed August 9, 2011 and amended on October 6, 2017 (“Spec.”); Non-Final Office Action mailed June 6, 2018 (“Non-Final Act.”); Appeal Brief filed November 2, 2018 (“Appeal Br.”); Examiner’s Answer mailed February 8, 2018 (“Ans.”); and Reply Brief filed April 8, 2019 (“Reply Br.”).

2 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 Corning, Inc. Appeal Br. 2.

3 Although the Appeal Brief states claims 1–20 are pending (Appeal Br. 4), claims 13 and 18–20 were cancelled in Responses to Office Actions filed on May 13, 2013 and April 3, 2015, respectively.
0.25 and 5, and a treatment time, $t_{\text{treatment}}$, with said mixture is:

$t_{\text{treatment, Cr}_2\text{O}_3 \text{ (in min)}} > t_{\text{diffusion, Cr}_2\text{O}_3} + t_{\text{reaction, Cr}_2\text{O}_3}$,

a diffusion time, $t_{\text{diffusion, Cr}_2\text{O}_3}$, and a reaction time, $t_{\text{reaction, Cr}_2\text{O}_3}$, have the following values:

$t_{\text{diffusion, Cr}_2\text{O}_3 \text{ (in min)}} = \frac{L^2}{60D_{\text{eff}}} \text{; and}$

$t_{\text{reaction, Cr}_2\text{O}_3 \text{ (in min)}} = \frac{4.3 \times 10^{-4} \left( d_p \text{ (in } \mu\text{m}) \right) \text{Exp}[12000/T \text{ (in K)}]}{y_{\text{Cl}_2} x_{\text{Cl}_2} \left(1 - 1.35 x_{\text{Cl}_2} + 0.372 x_{\text{Cl}_2}^2\right)}$

and

$L > 0$ and is a thickness of said silica based soot or said silica-based soot layer, $D_{\text{eff}}$ (in cm$^2$/sec) is a diffusion rate of said mixture through said silica-based soot layer or silica-based soot, $d_p > 0$ and is an initial particle size of said Cr$_2$O$_3$, $T$ is the treatment temperature, $x_{\text{Cl}_2} = (y_{\text{Cl}_2})/(y_{\text{Cl}_2} + y_{\text{CO}})$, and $y_{\text{Cl}_2}$ and $y_{\text{CO}}$ are the partial pressure of chlorine and carbon monoxide, respectively, in said mixture.

14. A method of treating a porous silica-based soot preform with a soot layer having a thickness L, said method comprising:

- treating said silica-based soot preform comprising ZrO$_2$, with CCl$_4$ in a carrier gas at a treatment temperature such that a concentration of CCl$_4$ is greater than 1%, by volume, and a treatment time, $t_{\text{treatment, ZrO}_2}$, with CCl$_4$ is:

$t_{\text{treatment, ZrO}_2 \text{ (in min)}} > t_{\text{diffusion, ZrO}_2} + t_{\text{reaction, ZrO}_2}$,

a diffusion time, $t_{\text{diffusion, ZrO}_2}$, and a reaction time, $t_{\text{reaction, ZrO}_2}$, have the following values:

$t_{\text{diffusion, ZrO}_2 \text{ (in min)}} = \frac{L^2}{60D_{\text{eff, CCl}_4}}$; and

$t_{\text{reaction, ZrO}_2 \text{ (in min)}}$ = , and
L>0 and is said soot layer thickness, $D_{\text{eff}, \text{CCl}_4}$ (in cm$^2$/sec) is a diffusion rate of CCl$_4$ through said porous silica-based soot preform, $T$ is the treatment temperature for treating said porous soot preform in said CCl$_4$ in a carrier gas, $y_{\text{CCl}_4}$ is a partial pressure of CCl$_4$, and $d_p>0$ and is an initial particle size of said ZrO$_2$.

Claims 1 and 7 are also independent and recite similar methods as recited in claims 4 and 14. *Id.* at 27–29.

REFERENCES

The prior art relied upon by the Examiner is:

<table>
<thead>
<tr>
<th>Name</th>
<th>Reference</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schultz</td>
<td>US 4,263,031</td>
<td>April 21, 1981</td>
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<tr>
<td>Pluijms et al.</td>
<td>US 4,854,956</td>
<td>August 8, 1989</td>
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<tr>
<td>hereinafter “Pluijms”</td>
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<tr>
<td>Kyoto et al.</td>
<td>US 4,969,941</td>
<td>November 13, 1990</td>
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<tr>
<td>hereinafter “Kyoto”</td>
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REJECTIONS

1. The Examiner rejected claims 1–6 and 9–12 under 35 U.S.C. § 103(a) as unpatentable over Burke and Schultz. Ans. 3–7; Non-Final Act. 4–8.

2. The Examiner rejected claims 7, 8, and 14–17 under 35 U.S.C. § 103(a) as unpatentable over Kyoto, Schultz, Pluijms, and Burke. Ans. 7–9; Non-Final Act. 8–10.


OPINION

Rejection 1

Appellant presents the same or similar arguments with respect to independent claims 1 and 4 subject to this rejection, relying on the dependency of the dependent claims as a basis for their patentability. See

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4 The Examiner withdrew the rejection of Claims 1–6 and 9–12 under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph. Ans. 12; Non-Final Act. 2–3.
Appeal Br. 13–22. We select claim 4 as representative for disposition of this rejection, with the patentability of the other claims standing or falling with claim 4. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner’s Rejection

As to claim 4, the Examiner found Burke discloses a method for treating silica-based soot containing chromium oxide. Ans. 3, citing Burke ¶¶ 8, 52, 53. The Examiner found Burke does not disclose a “layer” of silica-based soot as recited in claim 4, but the Examiner found Schultz discloses conventional methods of creating optical fibers involve creating soot layers 30 microns thick. Id. The Examiner determined it would have been obvious to use a conventional method as disclosed in Schultz to create a preform when using the Burke method, because Burke does not disclose how to make the preform. Id. at 3–4. The Examiner found Burke discloses a mixture as recited in claim 4 including components in concentrations meeting the recited CO:Cl₂ ratio as well as amounts that either meet or overlap the recited “greater than 10%, by volume” amount. Id. at 4.

As to the “treatment time” recited in claim 4, the Examiner set forth several alternative rationales as to how Burke either would meet or render obvious the recitations in claim 4. Id. at 4–6. In particular, the Examiner determined that because the method recited in claim 4 uses the same gases at the same temperature, and obtains the same results as in Burke, one of ordinary skill in the art would have expected Burke’s treatment is for the same duration recited in the claims, based on the needed treatment time necessary to remove Cr₂O₃ particles determined through routine experimentation. Id. at 6.
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Appellant’s Contentions

Appellant argues Burke does not disclose the particle size of Cr₂O₃ particles present in its article and that Burke and Schultz, individually or combined, fail to disclose or provide any reasoning for one of ordinary skill in the art to have considered the initial particle size of Cr₂O₃ particles in determining the reaction time for treating the silica based soot or article comprising silica based soot. Appeal Br. 14. Appellant contends the Examiner’s positions regarding Cr₂O₃ particle sizes and whether such particles would shrink over time, which are crucial to the Examiner’s obviousness rejection, are unsupported by any evidence. Id. at 14–19.

Appellant contends there is no basis for the Examiner’s position that the recitations in claim 4 as to reaction time would be determined by routine experimentation or would be inherently met. Id. at 19–22. Appellant contends Burke simply discloses the dry time for 1–4 hours is a parameter, and Burke does not disclose that increasing or decreasing drying time aids in removal of Cr₂O₃ particles based on the size of particles present. Id. at 19. Appellant argues that the reaction time requirements recited in the claims would not have been inherent as evidenced by the Specification, which provides examples where the treatment time exceeds the maximum drying time of 4 hours disclosed in Burke. Id. at 20.

Issue

The dispositive issue with respect to this rejection is:

Has Appellant demonstrated reversible error in the Examiner’s position that the method of treating silica-based soot or an article comprising a silica-based soot layer as recited in claim 4 would have been obvious over Burke in view of Schultz?
We are not persuaded by Appellant’s arguments. In particular, Burke discloses a process for manufacturing a soot preform employing a soot preform drying agent including at least one halide and at least one reducing agent, which removes metal oxides from the preform. Burke, ¶¶ 3, 8, 10, 13. Burke discloses: “[t]he removal of the impurities from the soot preform will eliminate fiber breaks which are attributed to the presence of the impurities.” Id. at ¶ 13. In a preferred embodiment, Burke discloses a mixture of CO and Cl₂ as the drying agent at temperatures from 900 to 1200 °C, which as discussed above, the Examiner found, and Appellant does not dispute, includes the temperatures, as well as the ratios and percentages by volume of CO and Cl₂ recited in claim 4. Burke ¶¶ 52, 53. Burke discloses “the draw blank is treated with the gas mixture for preferably about 1 to about 4 hours.” Id. at ¶ 53. We observe that Burke discloses preferable treatment times of 1–4 hours, and contemplates longer reaction times, such as 1–6 hours. Burke, ¶¶ 52, 53. Thus, Burke discloses the general process conditions of the CO and Cl₂ mixture and treatment temperatures recited in claim 4.

As to treatment time, it is true Burke does not disclose the particular treatment time relationship recited in claim 4, including $d_p$, the initial particle size of Cr₂O₃. However, as discussed above, Burke discloses removal of impurities causing fiber breaks from the preform attributed thereto. Thus, we are of the view that one of ordinary skill in the art, when applying the method disclosed in Burke to a preform produced in accordance with the combined teachings of Burke and Schultz, would do so such that all the Cr₂O₃ particles would be removed. In doing so, one of ordinary skill in the art would ensure the treatment time was sufficient in order to remove
such particles, which would necessarily satisfy the reaction time
requirements set forth in claim 4. See Burke, ¶ 46 (explaining that process
times must be examined when using different temperatures); see also Ans.

17. The Examiner’s rejection relies on the similarity of conditions disclosed
in Burke along with the purpose in Burke to remove impurities to eliminate
fiber breaks, which is the same as Appellant’s purpose (Spec. ¶ 11), to
support the position that the reaction time requirements recited in claim 4
would be satisfied. Indeed, claim 4 only recites a lower limit for the
treatment time, i.e., the treatment time must be greater than the diffusion
time and reaction time combined. See Ans. 19.

In this regard, we do not agree with Appellant that the Examiner’s
reasoning improperly reduces the claim language and the disclosure of
Burke to a single “gist” or “thrust” or that the Examiner’s statements that
Burke discloses the “complete” removal of particles constitute reversible
error. Reply Br. 4, 8–11. Rather, as discussed above, the Examiner relies on
specific teachings of the prior art to support the rejection. As to Appellant’s
argument that Burke fails to disclose “complete” removal of particles,
Appellant does not sufficiently explain why the express disclosures in Burke
that “metal oxides, and alkali metal oxides are removed from the soot
preform” (Burke ¶ 13, see also Burke ¶ 65) somehow means less than
“complete” removal, or that simply because Burke does not quantify the
results of the drying agent treatment, means Burke was unsuccessful, or one
of ordinary skill in the art would be unsuccessful in achieving the purpose
set forth therein.

As a result, we affirm the Examiner’s rejection of claims 1 and 4, as
well as claims 5, 6, and 9–12 dependent therefrom.
We limit our discussion to claim 14, which is sufficient for disposition of this rejection.

The Examiner’s Rejection

Regarding claim 14, the Examiner found Kyoto discloses treating a soot preform, but Kyoto fails to disclose ZrO₂ particles as impurities in the soot preform, the concentration and temperature, the soot layer thickness, or the treatment time having the requirements set forth in claim 7. Ans. 7–9, citing Kyoto, col. 15, ll. 56–63. The Examiner found Pluijms and Burke provide evidence that ZrO₂ particles are conventionally-known impurities in optical fiber preforms such that it would have been obvious to expect finding ZrO₂ particles as impurities in the Kyoto preform. Id. at 7. The Examiner found that the ranges of concentration of CCl₄ in Kyoto overlap the ranges claimed, which demonstrates a prima facie case of obviousness. Id. at 8. The Examiner found Schultz discloses conventional methods of creating optical fibers involve creating soot layers 30 microns thick, such that it would have been obvious to have used a conventional method of creating a preform when using the Burke method, because Burke does not disclose how to make the preform. Id. Regarding the reaction time, the Examiner found that in view of the heating procedure disclosed in Kyoto (col. 19, ll. 1–5), and inherent particle sizes of the ZrO₂ particles present in the Kyoto preform, the duration would be much less than one second. Id.

Appellant’s contentions

Appellant contends that, *inter alia*, Kyoto does not disclose ZrO₂ particles in its article, and that even taking into account the Examiner’s findings with respect to Pluijms and Burke that ZrO₂ is a known impurity in
optical fiber preforms, Kyoto does not provide any reasoning for selecting treatment times as recited in claim 14, because the reaction times and diffusion times in the claims are based on the particle size of ZrO₂. *Id.* at 24.

**Issue**

Has Appellant demonstrated reversible error in the Examiner’s position that Kyoto in combination with Schultz, Pluijms, and Burke would have rendered the treatment time recited in claim 14 obvious?

**Discussion**

We are persuaded by Appellant’s argument that the Examiner’s rejection, which relies on Pluijms or Burke for the position that ZrO₂ particles would be present in Kyoto, and thus the reaction times based on ZrO₂ particles would have been obvious, is not sufficiently supported. Kyoto merely discloses “dehydration of the soot preform” using chlorine-containing gases, and does not mention the presence of impurities such as ZrO₂ particles. Kyoto, col. 15, ll. 46-63. Moreover, Kyoto discloses making the muffle tube body disclosed therein from quartz glass as pure as possible to prevent contamination of the preform. Kyoto, col. 11, ll. 3–6; col. 12, ll. 47–54. Thus, the Examiner’s rationale is insufficient to establish that the preforms in Kyoto would contain ZrO₂ particles, or to explain why one of ordinary skill in the art would seek to treat the soot preform for a reaction time based on ZrO₂ particles in order to perform the “dehydration” treatment disclosed in Kyoto. Accordingly, the rejection does not provide sufficient reasoning that the reaction time requirements in claim 14 would be met or would have been obvious.

Therefore, we reverse the Examiner’s rejection of claims 7, 8, and 14–17.
We limit our discussion to claim 14, which is sufficient for disposition of these rejections.

**The Examiner’s Rejections**

The Examiner found Hiroo discloses a preform that is treated with CCl$_4$ in order to dry the preform. Ans. 9–11; Hiroo, Abstract. As with Rejection 2, the Examiner cited Pluijms and Burke for the proposition that one of ordinary skill in the art would expect to find ZrO$_2$ particles in the Hiroo preform. *Id.* at 11–12. The Examiner found that Figure 1(B) of Hiroo shows a zone treatment, which depends on the length of the preform, and that “it would have been obvious to perform routine experimentation to determine the time needed to dry the preform.” *Id.* at 11.

**Appellant’s Arguments**

Appellant argues, as with Rejection 2 above, that Hiroo does not disclose articles containing ZrO$_2$ particles, and Hiroo does not disclose a treatment time based on the particle size of ZrO$_2$ particles. Appeal Br. 24.

**Issue**

Has Appellant demonstrated reversible error in the Examiner’s position that Hiroo in combination with the other prior art cited would have rendered the treatment time recited in claim 14 obvious?

**Discussion**

We are persuaded by Appellant’s argument that the Examiner’s rejection, which relies on Pluijms or Burke for the position that ZrO$_2$ particles would be present in Hiroo in order to determine the reaction times based on ZrO$_2$ particles would have been obvious, is not sufficiently supported. Although Hiroo discloses dehydrating and reducing with a mixture of CCl$_4$ and O$_2$ gas in the English Abstract, Hiroo does not disclose
any particular reaction times, and the Examiner does not provide sufficient
explanation as to how such reaction times would translate into reaction times
based on ZrO₂ particles.⁵ In this regard, the Examiner’s rationale is based
only on the time necessary “to dry the preform” and the Examiner does not
explain how the presence of ZrO₂ particles relates to such drying time.
Thus, the Examiner’s rationale is insufficient to explain why one of ordinary
skill in the art would seek to treat the soot preform for a reaction time based
on ZrO₂ particles in order to perform the “dehydrating and reducing”
treatment disclosed in Hiroo, and does not provide sufficient reasoning that
the reaction time requirements in claim 14 would be met or would have been
obvious.

Accordingly, we reverse the Examiner’s rejections of claims 7, 8, 14–
17 as set forth in Rejections 3 and 4.

DECISION SUMMARY

In summary:

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<th>Claims Rejected</th>
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<th>Reference(s)/Basis</th>
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<td>Hiroo, Schultz, Pluijms, Burke, Fletcher, Kyoto</td>
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<td>Overall Outcome</td>
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<td></td>
<td>1–6, 9–12</td>
<td>7, 8, 14–17</td>
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⁵ We observe that the full English translation of Hiroo is not of record, and
therefore our review is limited by what is relied upon by the Examiner.
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-IN-PART