

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

Ex parte JU-HYUNG LEE, TROY KIM, SOOVO SEN,  
JUAN CARLOS ROCHA-ALVAREZ, LUN TSUEL,  
ANNAMALAI LAKSHMANAM, MAOSHENG ZHAO,  
INNA SHMURUN, and SHANKAR VENKATARAMAN

Appeal No. 2006-1871  
Application No. 10/245,442

ON BRIEF

Before KIMLIN, KRATZ and GAUDETTE, Administrative Patent Judges.  
KRATZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 13, 15, 21, 23, 29, and 31, which are all of the claims pending in this application. We have jurisdiction pursuant to 35 U.S.C. § 134.

BACKGROUND

Appellants' invention relates to a method for cleaning a chemical vapor deposition chamber. An understanding of the invention can be derived from a reading of exemplary claim 29, which is reproduced below.

29. A method for processing a substrate,  
comprising:  
introducing one or more precursors into a chemical  
vapor deposition chamber through a gas distribution  
plate heated by a heating mechanism disposed at a  
bottom plate of the gas distribution plate, wherein the  
heating mechanism comprises a heating element or a high  
temperature heat exchanger fluid;  
reacting the precursors to deposit a material on a  
substrate surfaces;  
removing the substrate from the chamber;  
introducing a cleaning gas into the chamber  
through the gas distribution plate; and  
reacting the cleaning gas with deposits within the  
chamber until substantially all the deposits are  
consumed.

The prior art references of record relied upon by the  
examiner in rejecting the appealed claims are:

Mandrekar et al (Mandrekar)	6,117,245	Sep. 12, 2000
Nguyen	6,565,661	May 20, 2003 (filed Jun. 04, 1999)
Ameen et al. (Ameen)	6,635,569	Oct. 21, 2003 (filed Apr. 20, 1999)
Satoh et al. (Satoh)	EP 1 118 692	Jul. 25, 2001

Claims 13, 15, 29, and 31 stand rejected under 35 U.S.C.  
§ 103(a) as being unpatentable over Nguyen in view of Ameen and  
Mandrekar. Claims 21 and 23 stand rejected under 35 U.S.C.  
§ 103(a) as being unpatentable over Nguyen in view of Ameen,  
Satoh and Mandrekar.

We refer to the brief and reply brief and to the answer for a complete exposition of the opposing viewpoints expressed by appellants and the examiner concerning the issues before us on this appeal.

OPINION

Having carefully considered each of appellants' arguments set forth in the brief and reply brief, appellants have not persuaded us of reversible error in the examiner's obviousness determinations as set forth in the answer. We adopt the examiner's factual findings set forth in the answer and substantially agree with the examiner's reasoning and rebuttal of arguments as set forth in the answer. Accordingly, we affirm the examiner's decision to reject the appealed claims under 35 U.S.C. § 103(a) for substantially the reasons set forth in the answer.

We add the following for emphasis.

In traversing the examiner's § 103(a) rejection of claims 13, 15, 29, and 31 as being unpatentable over Nguyen in view of Ameen and Mandrekar, appellants' main arguments focus on an alleged lack of suggestion or motivation for the examiner's proposed reference combination. Appellants essentially argue claims 13, 15, 29, and 31 as a group in so doing. Thus, we

select claim 29 as representative of the so rejected claims and shall primarily focus on that representative claim in our comments below with respect to those common arguments.<sup>1</sup>

Appellants (brief, page 11) assert that:

1. "Nguyen provides no description of cleaning a chamber";
2. "Ameen provides no discussion of utilizing a heating element or high temperature heat exchanger fluid"; and
3. "Mandrekar does not mention cleaning a deposition chamber."

Thus, appellants maintain that one of ordinary skill in the art would not find in the applied references a suggestion of the desirability of combining elements from each other to arrive at the subject matter of representative claim 29.

We disagree with appellants' limited characterization of the combined teachings of the applied references as they would be understood by one of ordinary skill in the art and as they relate

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<sup>1</sup> We shall briefly comment separately on the rejection of independent claim 13 to the extent that appellants' comments at page 11 of the brief may be considered to represent separate arguments for the patentability of that rejected claim.

to the here claimed subject matter. In essence, appellants seemingly argue that each of the applied references would have to describe all of the here claimed method steps in an anticipatory manner in order to be combinable and render the claimed subject matter unpatentable. Of course, that is not the legally mandated test for combining references. While there must be some teaching, reason, suggestion, or motivation to use the cleaning method of Ameen in conjunction with the deposition process of Nguyen with or without the specific heater of Mandrekar so as to result in the claimed process, it is not necessary that each of the cited references specifically suggest making that particular combination. Rather, the test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. See In re Young, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991) and In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).

Moreover, in evaluating such references it is proper to take into account not only the specific teachings of the references but also the inferences which one skilled in the art would reasonably be expected to draw therefrom. In re Preda, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968).

Here, we determine that there is ample motivation in the combined teachings of the references for one of ordinary skill in the art to have modified the deposition process of Nguyen to include a cleaning process sequence as taught by Ameen with a reasonable expectation of success in achieving a process corresponding to appellants' claimed process. See In re O'Farrell, 853 F.2d 894, 903-904, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988). In this regard, the examiner maintains that one of ordinary skill in the art would have been led to clean the chemical vapor deposition reaction chamber of Nguyen by introducing a cleaning gas through the gas distribution plate (showerhead) to react with deposits within the chamber after substrate removal as taught by Ameen to be advantageous for system stability. This is because the cleaning gas removes accumulated reactants, reaction products and byproducts from the reactor surfaces. See page 4, penultimate line through page 5, line 9, and pages 8 and 9 of the answer together with the portions of the applied reference referred to in that portion of the answer. Such reactor cleaning allows for continued use of the deposition reactor following the cleaning while avoiding contaminating substrates with reactor deposits that would otherwise have built up in the reactor and flaked off without the

periodic cleaning. See, e.g., column 7, lines 41-43 of Ameen.

As for the gas distribution plate heating element of representative claim 29, Nguyen discloses that a heating means should be employed at that location as pointed out by the examiner in the answer (page 4).

The claim term "heating element" does not require any particular type of heater. Thus, we do not find that the heating element of representative claim 29 requires a patentably distinct heater from that taught and suggested by Nguyen. In any event, we agree with the examiner that Mandrekar teaches a heating device for a gas distribution plate that is embraced by the claim language. Moreover, we agree with the examiner's assessment that one of ordinary skill in the art would have recognized the obviousness of employing the heating device of Mandrekar as the heating means in Nguyen for reasons set forth at page 8 of the answer.

Consequently, we are not persuaded by appellants' arguments in the briefs suggesting a lack of incentive for one of ordinary skill in the art to employ a cleaning process in conjunction with the CVD process of Nguyen based on the combined teachings of the applied references.

We note that claim 13 does not require introducing and reacting precursors to deposit material on a substrate prior to removing the substrate from a chemical deposition chamber, as does representative claim 29. Rather, claim 13 begins with cleaning gas introduction, albeit claim 13 is open to other steps including deposition steps given the "comprising" transitional term utilized therein. As for the separate mention of independent claim 13 at page 11 of the brief, we note that the arguments presented for that claim mirror the arguments made for representative claim 29, which we find unpersuasive for reasons set forth above and in the answer.

Concerning the examiner's separate obviousness rejection of claims 21 and 23, appellants argue claims 21 and 23 together. Thus, we select claim 21 as the representative claim on which we shall decide this appeal as to this rejection.

Appellants refer to the same arguments made against the examiner's § 103(a) rejection of claims 13, 15, 29, and 31 as being unpatentable over Nguyen in view of Ameen and Mandrekar in arguing against the examiner's § 103(a) rejection of claims 21 and 23 as being unpatentable over those same references further taken with Satoh. For the reasons and factual findings set forth

by the examiner in the answer and above, we do not find those arguments persuasive.

Representative claim 21 requires the use of a remote plasma source. The cleaning gas is introduced into that remote plasma source and a reactive species formed before the reactive cleaning gases/species are introduced into the gas distribution plate of the chemical deposition chamber for the cleaning thereof. In this regard, the examiner additionally relies on Satoh in rejecting claims 21 and 23 to establish the obviousness of employing a remote plasma source with the cleaning gas.

The examiner has determined that:

Satoh et al. teaches that providing the cleaning gas from a remote plasma source (i.e., introducing the cleaning gas into a remote plasma source connected to the chamber, striking a plasma in the remote source to form a reactive species, and importing the reactive species through a showerhead- Figure 1, paragraphs [0058] and [0074]-[0076]) rather than forming an *in situ* plasma has the advantage of preventing electrode damage and impurity contamination (Abstract, paragraph [0005]). Therefore, it would have been obvious to one of ordinary skill in the art to use a remote plasma for the cleaning gas . . . to achieve these advantages . .

. .

See the paragraph bridging pages 6 and 7 of the answer.

Appellants (brief, page 12) acknowledge that Satoh discloses a remote plasma that is used for cleaning a deposition chamber but note that Satoh does not disclose a heating mechanism for the

gas distribution bottom plate, as claimed. Appellants argue, similarly to the arguments advanced above, that the applied references, individually or in combination, do not suggest the desirability of combining elements from each to arrive at the claimed subject matter. However, the examiner has furnished a persuasive rationale (reproduced above) for the proposed combination that is founded on the teachings of the references. The rationale furnished by the examiner has not been specifically addressed by, much less, persuasively rebutted by appellants in the briefs. As for the heating of the gas distribution plate bottom, the examiner (answer, page 10) notes that Nguyen and Mandrekar teach/suggest that chamber gas distribution plate feature.

As a final point, we note that appellants have not argued that the claimed subject matter is attended by unexpected results, much less furnished any evidence with the briefs in support of such an argument.

Consequently, on this record, we sustain both of the examiner's § 103(a) rejections.

#### CONCLUSION

The decision of the examiner to reject claims 13, 15, 29, and 31 under 35 U.S.C. § 103(a) as being unpatentable over Nguyen

in view of Ameen and Mandrekar; and to reject claims 21 and 23 under 35 U.S.C. § 103(a) as being unpatentable over Nguyen in view of Ameen, Satoh and Mandrekar is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

EDWARD C. KIMLIN )  
Administrative Patent Judge )  
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 ) BOARD OF PATENT  
PETER F. KRATZ ) APPEALS  
Administrative Patent Judge ) AND  
 ) INTERFERENCES  
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LINDA R. GAUDETTE )  
Administrative Patent Judge )

PK/sld

PATTERSON & SHERIDAN, LLP  
3040 POST OAK BLVD., SUITE 1500  
HOUSTON, TX 77056

**Comment [jvn1]:** Type address

APPEAL NO. - JUDGE KRATZ  
APPLICATION NO.

APJ KRATZ

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**DECISION: ED**

Prepared By:

**DRAFT TYPED:** 01 Aug 06

**FINAL TYPED:**