

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

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* SANJEEV AGGARWAL, KELLY J. TAYLOR,  
and ANGELICA THOMAS

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Appeal 2006-2133  
Application 10/679,144  
Technology Center 2800

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Decided: February 28, 2007

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Before JOSEPH F. RUGGIERO, LANCE LEONARD BARRY, and  
MAHSHID D. SAADAT, *Administrative Patent Judges*.

RUGGIERO, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal involves claims 74-76 and 80-97, the only claims pending in this application. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b) (2002).

## INTRODUCTION

The claims are directed to the fabrication of a haze free lead zirconate titanate,  $\text{Pb}(\text{ZrTi})\text{O}_3$ , film, known as a PZT film, on a semiconductor wafer. The PZT film fabrication includes a preheat step in which a vacuum, an inert gas, or a mixture of an inert gas and an oxidizer gas is used to preheat the semiconductor wafer prior to the PZT film deposition.

Claim 74 is illustrative:

74. A haze free PZT film prepared in accordance with the method comprising:

forming a front-end structure over a semiconductor substrate;

forming a bottom electrode over said front-end structure;

preheating said semiconductor wafer, and

forming a PZT film over said bottom electrode;

wherein said preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an ambient comprised of a mixture of an inert gas and an oxidizer gas.

The Examiner relies on the following prior art references to show unpatentability:

Isobe	US 6,114,199	Sep. 5, 2000
Sakurai	US 6,350,644 B1	Feb. 26, 2002
Basceri	US 6,444,478 B1	Sep. 3, 2002
Gilbert	US 6,730,354 B2	May 4, 2004 (filed Aug. 8, 2001)

The rejections as presented by the Examiner are as follows:

1. Claims 74-76, 80-85, 87-91, 93-95, and 97 are rejected under 35 U.S.C. § 102(e) as anticipated by Basceri.
2. Claims 74, 75, 80-82, 84, 85, 87-91, and 93 are rejected under 35 U.S.C. § 102(e) as anticipated by Gilbert.
3. Claims 86, 92, and 96 are rejected 35 U.S.C. § 103(a) as unpatentable over Basceri.
4. Claims 83 is rejected 35 U.S.C. § 103(a) as unpatentable over Gilbert.
5. Claims 86 and 92 are rejected 35 U.S.C. § 103(a) as unpatentable over Gilbert in view of Sakurai.
6. Claims 76 and 95-97 are rejected 35 U.S.C. § 103(a) as unpatentable over Sakurai in view of Isobe.
7. Claim 94 is rejected 35 U.S.C. § 103(a) as unpatentable over Sakurai in view of Isobe and Gilbert.

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the Briefs<sup>1</sup> and Answer for the respective details.

## OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the Examiner, the arguments in support of the rejections, and the evidence of anticipation and obviousness relied upon by the Examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, Appellants' arguments set forth in the Briefs along with the Examiner's rationale in support of the rejection and arguments in rebuttal set forth in the Examiner's Answer.

It is our view, after consideration of the record before us, that the disclosure of Basceri fully meets the invention as recited in claims 74-76, 80-85, 87-91, and 93-95, and Gilbert fully meets the invention as recited in claims 74, 75, 80-82, 84, 85, 87-91, and 93. In addition, with respect to the Examiner's obviousness rejection, we are of the opinion that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the invention as set forth in the appealed claims 76, 83, 86, 92 and 94-97. Accordingly, we affirm.

We consider first the Examiner's 35 U.S.C. § 102(e) rejection of claims 74-76, 80-85, 87-91, 93-95, and 97 based on Basceri. At the outset, we note that it is well settled that anticipation is established only when a

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<sup>1</sup> The Appeal Brief was filed December 14, 2005. In response to the Examiner's Answer mailed February 28, 2006, a Reply Brief was filed March 24, 2006, which was acknowledged and entered by the Examiner as indicated in the communication dated May 8, 2006.

single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. *RCA Corp. v. Applied Digital Data Systems, Inc.*, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir.); 468 U.S. 1228 (1984); *W.L. Gore and Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983), 469 U.S. 851 (1984).

With respect to independent claims 74-76, the Examiner indicates (Answer 4) how the various limitations are read on the disclosure of Basceri. In particular, the Examiner directs attention to various portions of the disclosure at columns 6-9 of Basceri.

In our view, the Examiner's analysis is sufficiently reasonable that we find that the Examiner has at least satisfied the burden of presenting a prima facie case of anticipation. The burden is, therefore, upon Appellants to come forward with evidence and/or arguments which persuasively rebut the Examiner's prima facie case. Only those arguments actually made by Appellants have been considered in this decision. Arguments which Appellants could have made but chose not to make in the Briefs have not been considered and are deemed to be waived [see 37 CFR § 41.37(c)(1)(vii) (2004)].

Appellants' arguments in response assert that the Examiner has not shown how each of the claimed features is present in the disclosure of Basceri so as to establish a case of anticipation. Appellants' arguments (Br. 14-16; Reply Br. 6) focus on the contention that, in contrast to the claimed invention, Basceri does not disclose the preheating of the wafer before the deposition of the PZT film.

After reviewing the Basceri reference in light of the arguments of record, however, we are in general agreement with the Examiner's position as stated in the Answer. In particular, we agree with the Examiner (Answer 13-14) that Basceri's disclosure (col. 7, ll. 26-34) that the wafer is heated before contact with the precursor can only be reasonably interpreted to indicate that the wafer is heated, i.e., preheated, before deposition of the PZT film. Further, although Appellants argue (Br. 14) the use of a precursor, such as in Basceri, "is not the same as the use of gases during a preheat step," there is nothing in the claim language which precludes the use of a precursor in preparing a wafer for PZT deposition.

In view of the above discussion, since all of the claimed limitations are present in the disclosure of Basceri, the Examiner's 35 U.S.C. § 102(e) rejection of independent claims 74-76 is sustained.

We also sustain the Examiner's 35 U.S.C. § 102(e) rejection, based on Basceri, of dependent claims 80-85, 87-91, 93-95, and 97. Aside from merely repeating the language of the dependent claims, Appellants' sole arguments reiterate those made with respect to independent claims 74-76, which arguments we found to be unpersuasive for all the reasons discussed *supra*. Simply pointing out what a claim requires with no attempt to point out how the claims patentably distinguish over the prior art does not comply with 37 C.F.R. § 41.37(a)(vii) and does not amount to a separate argument for patentability, *In re Nielson*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987).

Turning to a consideration of the Examiner's 35 U.S.C. § 102(e) rejection, based on Gilbert, of claims 74, 75, 80-82, 84, 85, 87-91, and 93, we sustain this rejection as well. With respect to independent claims 74 and

75, Appellants' arguments in response initially assert that, contrary to the claimed invention, Gilbert does not disclose a semiconductor wafer preheating operation in which the semiconductor wafer is placed "on" the heater. According to Appellants (Br. 28-29), Gilbert fails to disclose this feature since the preheating operation disclosed by Gilbert requires that the wafer 22 be suspended by lift pins 62 over susceptor 24. We agree with the Examiner (Answer 16), however, that Gilbert can be reasonably interpreted as disclosing the placing of the wafer "on" the heater since there is nothing in the claim language which requires direct contact between the heater and the wafer or, conversely, precludes the use of an intermediary structure such as Gilbert's lift pins 62.

We also find to be unpersuasive Appellants' contention (Br. 29) that, although Gilbert discloses the use of an oxidizing co-reactant gas and a purge gas during PZT deposition, there is no disclosure of such gases being used during a preheating step as claimed. We agree with the Examiner (Answer 16) that, Appellants' arguments to the contrary notwithstanding, Gilbert discloses at column 3, lines 43-56 the use of inert and oxidizing gases during the preheating process.

We further agree with the Examiner (Answer 16) that Gilbert discloses the use of Ar, N<sub>2</sub>, He, and O<sub>2</sub> gases as set forth in appealed claims 80-82 and 87-89, as well as the PbZrO<sub>3</sub> limitation of claim 93. We also find no error in the Examiner's finding (Answer 16-17) that Gilbert has a disclosure which corresponds to the "2% excess Pb" and "solid solution" features, respectively, of dependent claims 84, 85, 90, and 91.

We also sustain the Examiner's 35 U.S.C. § 103(a) rejection of dependent claim 93 based on Basceri. Appellants' argument in response to

the Examiner's rejection relies on arguments made previously alleging the failure of Basceri to disclose the claimed preheating step, which argument we found to be without merit as discussed *supra*. We also find no error in the Examiner's finding (Answer 18) of obviousness to the ordinarily skilled artisan of adjusting the doping of the PZT film with up to 5% La, especially in view of the fact that Appellants' Specification discloses no criticality in the 5% figure, or that such a dopant concentration produces any unexpected or novel results.

Similarly, the Examiner's 35 U.S.C. § 103(a) rejection of dependent claim 83 based on Gilbert is also sustained since Appellants' disclosure provides no indication of any criticality of the claimed 20% Argon component of the inert/oxidizer gas mixture. As pointed out by the Examiner (Answer 19), Appellants' Specification (5, ll. 7-10) belies the criticality of the Argon component since the use of other inert gases, or no gas at all, during the preheating step is suggested.

We further sustain the Examiner's 35 U.S.C. § 103(a) rejection of dependent claims 86 and 92 based on the combination of Gilbert and Sakurai. To whatever extent Appellants are suggesting (Br. 43-46) that the Examiner's proposed combination of Gilbert and Sakurai must fail since, in Appellants' view, Sakurai does not disclose a preheating step in a PZT film deposition process, we find such contention to be without merit since the Examiner has relied upon Gilbert for this teaching. It is apparent from the Examiner's line of reasoning in the Answer that the basis for the obviousness rejection is the combination of Gilbert and Sakurai. As pointed out by the Examiner (Answer 19), one cannot show nonobviousness by attacking references individually where the rejections are based on

combinations of references. *In re Keller*, 642 F. 2d 413, 425, 208 USPQ 871, 881(CCPA 1981); *In re Merck & Co., Inc.*, 800 F. 2d 1091, 1096, 231 USPQ 375, 380 (Fed. Cir. 1986).

We further find to be without merit Appellants' attack on Sakurai as failing to disclose doping with Nb material since the claims are written in alternative format and Sakurai clearly discloses doping with La material. We also find no error in the Examiner's line of reasoning (Answer 23) that the stoichiometry of the PZT film disclosed by Sakurai supports a 5% contribution of La material as claimed.

We also sustain the Examiner's obviousness rejection of claims 76 and 95-97 based on the combination of Sakurai and Isobe. Unlike previously discussed independent claims 74 and 75 which require the presence of inert and oxidizer gases during preheating, independent claim 76 sets forth that the preheating step takes place in a vacuum. Appellants' arguments in response (Br. 46-48) initially focus on the contention that nowhere in the Sakurai disclosure is there any mention of a preheating step as presently claimed. We agree with the Examiner (Answer 21), however, that although the term "preheating" is not used by Sakurai, the disclosure at column 7, lines 40-45 of Sakurai, which discusses the formation of the bottom electrode at a substrate temperature of 600 degrees C, can be considered a "preheating" step since it takes place before the deposition of the PZT film.

We also find to be without merit Appellants' attack on the Isobe reference as failing to disclose both the use of a PZT film and a preheating step as presently claimed. As pointed out by the Examiner (Answer 21-22), however, Sakurai is relied upon for a disclosure of preheating before PZT

film deposition, with Isobe relied upon only for a teaching of the formation of a bottom electrode over a front-end structure.

With respect to dependent claims 95-97, we find no error in the Examiner's finding (Answer 22-23) that Sakurai has a disclosure which corresponds to the claimed "solid solution," "5% doping," and  $\text{PbZrO}_3$  features of these claims.

Lastly, we also sustain the Examiner's 35 U.S.C. § 103(a) rejection of dependent claim 94 in which Gilbert is added to the combination of Sakurai and Isobe to address the "at least 2% excess Pb" feature of this claim. We disagree, for all of the reasons stated above, with Appellants' arguments that Sakurai has no preheating step since we find no error in the Examiner's assertion that Sakurai's disclosed heating of the wafer during the formation of the bottom electrode is a preheating step performed before the deposition of the PZT film. As to Appellants' attack (Br. 21) on the Examiner's proposed combination, we would point out, as did the Examiner (Answer 21), that Sakurai, not Isobe, was not relied upon to provide a teaching of the formation of a PZT film. The Isobe reference, on the other hand, was relied upon to provide a teaching of the formation of a front-end structure.

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### CONCLUSION

In summary, we have sustained the Examiner's rejections of all the claims on appeal. Therefore, the decision of the Examiner rejecting claims 74-76 and 80-97 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(effective September 13, 2004).

AFFIRMED

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