

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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

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Appeal No. 2006-2922  
Application No. 10/012,677

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#### **ON BRIEF**

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Before JERRY SMITH, BARRY, and BLANKENSHIP, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

### **DECISION ON APPEAL**

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 16-22. Claims 1-15 and 23-29 have been cancelled.

## THE INVENTION

The disclosed invention pertains to methods of forming silicon-doped aluminum oxide, and methods of forming transistors and memory devices.

Representative claim 16 is reproduced as follows:

16. A method of forming a transistor, comprising:

- forming an insulating layer of silicon-doped porous aluminum oxide over a substrate, the forming the insulating layer of silicon-doped porous aluminum oxide comprising:
  - evaporating aluminum oxide from a single crystal sapphire;
  - evaporating silicon monoxide from a source comprising silicon monoxide;
  - forming a vapor mixture comprising the evaporated aluminum oxide and evaporated silicon monoxide in a reaction chamber to form a mixture; and
  - depositing of at least some of the evaporated aluminum oxide and silicon from the evaporated silicon monoxide on the substrate to form Al<sub>2</sub>O<sub>3</sub> doped with silicon atoms on the substrate, an amount of silicon within the silicon-doped aluminum oxide being controlled by controlling the rate of the evaporating silicon monoxide, the forming the mixture and the depositing being conducted without flowing O<sub>2</sub> into the chamber;

Application No. 10/012,677

- forming a patterned conductive material over the insulating layer of silicon-doped porous aluminum oxide; and
- forming a pair of conductive source/drain regions by implanting dopant into the substrate through the silicon-doped porous aluminum oxide, the pair of source/drain regions being spaced from one another by the patterned conductive material; the conductive material defining a transistor gate between the source/drain regions.

## **THE REFERENCES**

The examiner relies on the following references:

Fujisada	JP 60-167352	Aug. 30, 1985
Lee et al. (Lee)	5,923,056	July 13, 1999
Suh	6,093,612	July 25, 2000

- Vossen et al. (Vossen), "Thin Film Processess II", Academic Press Inc., Boston, 1991, pages 80-81, 108-110, 113-115, 188, and 200.
- Wolf, Stanley et al (Wolf-1), "Silicon Processing For The VLSI Era Vol. 1: Process Technology", Lattice Press, Sunset Beach Ca., 1986, pages 5 and 323.
- Wolf, Stanley (Wolf-2), "Silicon Processing For The VLSI Era Vol. 2: Process Integration", Lattice Press, Sunset Beach Ca., 1990, pages 332, 333 and 354-356.

Application No. 10/012,677

The examiner has made of record the following extrinsic evidence to support the examiner's contention that sapphire is a single crystal by definition:

Wikipedia web page at: (<http://en.wikipedia.org/wiki/Sapphire>)

Kinoshita et al. (Kinoshita) 6,809,010

Oct. 26, 2004  
(filed Feb. 28, 1997)

### **THE REJECTIONS**

The following rejections are on appeal before us:

1. Claims 16-18 and 20-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Lee in view of Vossen, and further in view of Fujisada, Wolf-1, and Wolf-2.
2. Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Lee in view of Vossen, and further in view of Fujisada, Wolf-1, Wolf-2, and Suh.

Rather than repeat the arguments of appellants or the examiner, we make reference to the briefs and the answer for the respective details thereof.

**OPINION**

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer. 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 C.F.R. § 41.37(c)(1)(vii)(2004). See also In re Watts, 354 F.3d 1362, 1368, 69 USPQ2d 1453, 1458 (Fed. Cir. 2004).

It is our view, after consideration of the record before us, that the evidence relied upon by the examiner does not support the examiner's rejection of claims 16-22. Accordingly, we reverse.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of

Application No. 10/012,677

obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). The examiner must articulate reasons for the examiner's decision. In re Lee, 277 F.3d 1338, 1342, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002). In particular, the examiner must show that there is a teaching, motivation, or suggestion of a motivation to combine references relied on as evidence of obviousness. Id. at 1343, 61 USPQ2d at 1433-34. The examiner cannot simply reach conclusions based on the examiner's own understanding or experience - or on his or her assessment of what would be basic knowledge or common sense. Rather, the examiner must point to some concrete evidence in the record in support of these findings. In re Zurko, 258 F.3d 1379, 1386, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001). Thus the examiner must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the examiner's conclusion. However, a suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art, as the teaching, motivation, or suggestion may be implicit from the prior art as a

Application No. 10/012,677

whole, rather than expressly stated in the references. The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. In re Kahn, 441 F.3d 977, 987-88, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) citing In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000). See also In re Thrift, 298 F. 3d 1357, 1363, 63 USPQ2d 2002, 2008 (Fed. Cir. 2002). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. See In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See Id.; In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976).

Application No. 10/012,677

We consider first the examiner's rejection of claims 16-18 and 20-22 as being unpatentable over the teachings of Lee in view of Vossen, and further in view of Fujisada, Wolf-1, and Wolf-2. Since appellants' arguments with respect to this rejection have treated these claims as a single group which stand or fall together, we will consider independent claim 16 as the representative claim for this rejection. See 37 C.F.R. § 41.37 (c)(1)(vii) (2004).

Appellants argue that the combination of prior art cited by the examiner fails to teach or suggest each and every element in representative claim 16. Specifically, appellants assert that the combination proffered by the examiner has no teaching of a two-source evaporative system that utilizes aluminum oxide and silicon monoxide [brief, page 10]. Appellants further assert that the recited limitation of "forming the mixture and the depositing being conducted without flowing O<sub>2</sub> into the chamber" is not disclosed by the prior art [brief, pages 11 and 12]. Appellants also assert that the prior art of record fails to disclose or suggest controlling the amount of silicon present by controlling the evaporation rate of silicon monoxide [brief, page 12]. Appellants argue that the examiner has improperly formulated the rejection by impermissibly relying upon hindsight [brief, page 11].

Application No. 10/012,677

The examiner disagrees [answer, page 12]. The examiner essentially argues that a two-source evaporative system that utilizes aluminum oxide and silicon monoxide would have been obvious because "one skilled in the art would recognize that any listed source could be combined with any other listed source to form a compatible compound" [answer, page 13, ¶4, cont'd page 14, ¶1]. The examiner further argues that one of ordinary skill in the art would recognize that "if there is sufficient oxygen in the chamber (for any compound formation) additional oxygen would not be supplied" [answer, page 15, ¶2]. With respect to the recited limitation of controlling the amount of silicon present by controlling the evaporation rate of silicon monoxide, the examiner asserts that Vossen's disclosure is "directed toward each and every material listed within the tables as well as any non-listed material that can be used as a target" [answer, page 16, ¶2].

In the reply brief, appellants note that Vossen's disclosure in Table II (pages 108 and 109) does not disclose any two-source system that utilizes an aluminum oxide-comprising source or forms an aluminum oxide-comprising film [reply brief, page 2, ¶3].

At the outset, we note that to reach a proper conclusion under §103, the examiner, as finder of fact, must step backward in time and into the mind of a person of ordinary skill in the art at a time when the invention was unknown, and just before it was made. In light of all the evidence, we

Application No. 10/012,677

review the specific factual determinations of the examiner to ascertain whether the examiner has convincingly established that the claimed invention as a whole would have been obvious at the time of the invention to a person of ordinary skill in the art. When claim elements are found in more than one prior art reference, the fact finder must determine "whether a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims." In re Kahn 441 F.3d at 988, 78 USPQ2d at 1337. With respect to the role of the examiner as finder of fact, the Court of Appeals for the Federal Circuit has stated: "the examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." In re Oetiker, 977 F.2d at 1445, 24 USPQ2d at 1444. The Court of Appeals for the Federal Circuit has also noted: "[w]hat the prior art teaches, whether it teaches away from the claimed invention, and whether it motivates a combination of teachings from different references are questions of fact." In re Fulton, 391 F.3d 1195, 1199-1200, 73 USPQ2d 1141, 1144 (Fed. Cir. 2004) (internal citations omitted).

Application No. 10/012,677

After carefully considering all of the evidence before us, we agree with appellants that the combination proffered by the examiner fails to fairly teach or suggest a two-source evaporative system that utilizes aluminum oxide and silicon monoxide, as claimed. We acknowledge that Vossen discloses co-evaporation using multiple sources [p. 110]. However, we find no evidence of record to support the examiner's assertion that the "choice of SiO and Al<sub>2</sub>O<sub>3</sub> sources are well known" and therefore would have been an obvious "design choice" to an artisan [see answer, page 6].

We further agree with appellants that the recited limitation of "forming the mixture ... without flowing O<sub>2</sub> into the chamber" is not fairly disclosed nor suggested by the prior art. In contrast, we find that Lee teaches away from the instant claimed invention by explicitly disclosing the formation of an aluminum oxide film in an argon/oxygen atmosphere [col. 5, lines 59-61]. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, ... would be led in a direction divergent from the path that was taken by the applicant." Tec Air, Inc. v. Denso Mfg. Mich. Inc., 192 F.3d 1353, 1360, 52 USPQ2d 1294, 1298 (Fed. Cir. 1999). We note that our reviewing court has reaffirmed that "[a] prima facie case of obviousness can be rebutted if the applicant ... can show 'that the art in any

Application No. 10/012,677

material respect taught away' from the claimed invention." In re Geisler, 116 F.3d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997) (quoting In re Malagari, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974)).

Lastly, we agree with appellants that the prior art relied on by the examiner on this record fails to disclose or suggest controlling the amount of silicon within the silicon-doped aluminum oxide by controlling the evaporation rate of silicon monoxide, as claimed.

For at least the aforementioned reasons, we agree with appellants' that the combination of references relied on by the examiner fails to fairly teach or suggest all the limitations of representative claim 16. Therefore, we agree with appellants' that the examiner has failed to meet his/her burden of presenting a prima facie case of obviousness. Accordingly, we will reverse the examiner's obviousness rejection of representative claim 16 as being unpatentable over Lee in view of Vossen, and further in view of Fujisada, Wolf-1, and Wolf-2. Because we have reversed the examiner's rejection of single independent claim 16, we will not sustain the examiner's rejection of any of the dependent claims 17-22 under appeal.

In summary, we will not sustain the examiner's rejection of any of the claims under appeal. Therefore, the decision of the examiner rejecting claims 16-22 is reversed.

REVERSED

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Jerry Smith )  
Administrative Patent Judge )  
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Lance Leonard Barry )  
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Application No. 10/012,677

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