The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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

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Appeal No. 2005-1894
Application No. 10/209,004

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ON BRIEF

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Before OWENS, RUGGIERO, and DIXON, *Administrative Patent Judges*.
OWENS, *Administrative Patent Judge*.

*DECISION ON APPEAL*

This appeal is from a rejection of claims 2 and 4-11.

*THE INVENTION*

The appellants claim a method for forming an electrode having a nodular shape,[1] and claim methods for forming a capacitor, a semiconductor device, a memory array and a wafer that include the method for forming the electrode. Claim 2,

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[1] The appellant states (specification, page 15, lines 20-25): "As used herein to define the present invention, the term 'nodular shape' means a structure having a finite cross section which includes a curved or partially curved cross section, and a partially square or rectangular cross section having curved corners, partially curved corners or faceted corners and having a width equal to or greater than the width of the contact 64 or 114. The term 'nodular shape' does not incorporate either a square cross section or a rectangular cross section."

which claims the method for forming the electrode, is illustrative:

2. A method for forming an electrode comprising:

forming an insulating layer;

forming a contact in said insulating layer;

forming an electrode layer on said insulating layer and on said contact;

etching said electrode layer utilizing a dry etch; and

etching said electrode layer utilizing a wet etch to form an electrode having a nodular shape.

*THE REFERENCES*

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|---|---|---|
| Sandhu et al. (Sandhu) | 5,381,302 | Jan. 10, 1995 |
| Hosaka[2] (Japanese Kokai) | 62-115767 | May 27, 1987 |

*THE REJECTION*

Claims 2 and 4-11 stand rejected as being unpatentable over Sandhu in view of Hosaka.

*OPINION*

We affirm the aforementioned rejection.

The appellant states that the claims stand or fall in three groups: 1) claims 2, 4-6 and 10; 2) claims 7 and 9; and

[2] Citations herein to Hosaka are to the English translation thereof which is of record.

3) claims 8 and 11 (brief, page 4). We therefore limit our discussion to one claim in each group, i.e., claims 2, 7 and 8. *See In re Ochiai*, 71 F.3d 1565, 1566 n.2, 37 USPQ2d 1127, 1129 n.2 (Fed. Cir. 1995); 37 CFR § 1.192(c)(7)(1997).

*Claim 1*

Sandhu discloses a method for forming a storage node electrode of a capacitor in a dynamic random access memory (DRAM) device, comprising forming an insulating layer (40; figure 3), forming a contact (65) in the insulating layer (figure 5), forming an electrode layer (85) on the insulating layer and the contact (figure 11A), and etching the electrode layer using a dry etch (col. 6, lines 60-64). Sandhu does not disclose etching the electrode layer using a wet etch to form the electrode into a nodular shape.

Hosaka etches the lower electrode of a nonvolatile memory or DRAM using a dry etch and then a wet etch to remove the surface roughness and distortions on the lower electrode and to round the corner portions of the lower electrode’s side surface, thereby preventing degradation of the quality of an insulating film formed on the lower electrode and obtaining good electrical characteristics (page 3).

The appellant argues that Sandhu would not have suggested eliminating surface roughness or sharp corners on a platinum electrode to provide a smooth topology (brief, page 6; reply brief, page 3). That argument is not well taken because the appellants are attacking the reference individually when the rejection is based upon a combination of references. *See In re Keller*, 642 F.2d 413, 426, 208 USPQ 871, 882 (CCPA 1981); *In re Young*, 403 F.2d 754, 757-58, 159 USPQ 725, 728 (CCPA 1968). Hosaka is relied upon by the examiner for a suggestion to dry etch and then wet etch Sandhu's lower electrode to remove surface roughness and distortions and to form the lower electrode into a nodular shape by rounding the corner portions of the lower electrode's side surface (answer, page 4).

The appellant argues that neither Sandhu nor Hosaka discloses a desire to reduce current leakage (brief, pages 6-7; reply brief, page 2). To establish a *prima facie* case of obviousness, references need not be combined for the purpose of solving the problem solved by the appellants. *See In re Kemps*, 97 F.3d 1427, 1430, 40 USPQ2d 1309, 1311 (Fed. Cir. 1996)*; In re Beattie*, 974 F.2d 1309, 1312, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992); *In re Dillon*, 919 F.2d 688, 693, 16 USPQ2d 1897, 1901 (Fed. Cir. 1990) (*en banc*), *cert. denied*, 500 U.S. 904 (1991); *In*

*re Lintner*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972). Sandhu and Hosaka would have fairly suggested, to one of ordinary skill in the art, using Hosaka's method in Sandhu's method to provide the above-discussed benefits disclosed by Hosaka.

The appellant argues that "Sandhu teach[es] away from the use of polysilicon electrode materials such as those taught by Hosaka because they are subject to oxidation" (brief, page 7). This argument is not convincing because Hosaka teaches that the electrode material can be platinum (page 5), which is the same material used by Sandhu (col. 6, line 52).

The appellant argues that "while Hosaka teach[es] the use of platinum as a possible electrode material, it is clear from reading the reference that polysilicon is the preferred material for use, as evidenced by Hosaka's disclosure and working examples" (brief, pages 7-8). We are not persuaded by this argument because Hosaka is not limited to its preferred embodiments, *see In re Kohler*, 475 F.2d 651, 653, 177 USPQ 399, 400 (CCPA 1973); *In re Mills*, 470 F.2d 649, 651, 176 USPQ 196, 198 (CCPA 1972); *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969), or to its working examples. *See In re Fracalossi*, 681 F.2d 792, 794 n.1, 215 USPQ 569, 570 n.1 (CCPA 1982); *Mills*, 470 F.2d at 651, 176 USPQ at 198.

The appellants argue that “there is no teaching or suggestion in Hosaka as to how such metal electrode materials should be etched if they are to be used in place of the polysilicon film” (brief, page 8). Hosaka’s disclosure that the electrode material can be platinum (page 5) indicates that one of ordinary skill in the art would have been capable of forming an electrode made of that metal. The appellant has provided no evidence or technical reasoning to the contrary.

We therefore conclude that the method claimed in the appellant’s claim 1 would have been obvious to one of ordinary skill in the art over the applied prior art. Accordingly, we affirm the rejection of that claim and claims 4-6 and 10 that stand or fall therewith.

*Claim 7*

Claim 7 requires forming a layer of a barrier material in a barrier hole such that the layer of barrier material contacts a contact and is substantially coplanar with the surface of an insulating layer. Such a structure is disclosed by Sandhu (figure 10A, barrier hole containing barrier layer 75 (col. 5, lines 64-65) substantially coplanar with insulating layer 40).

The appellant argues that Sandhu does not disclose forming an electrode having a nodular shape (brief, page 9). This

argument is not persuasive because, as discussed above regarding the rejection of claim 2, Hosaka would have fairly suggested, to one of ordinary skill in the art, forming Sandhu's lower electrode into a nodular shape.

The appellant argues that Hosaka does not form a contact (reply brief, pages 3-4). Such a disclosure is not needed for establishing a *prima facie* case of obviousness of the claimed invention because Sandhu's method includes forming a contact (65).

For the above reasons we affirm the rejection of claim 7 and claim 9 that stands or falls therewith.

*Claim 8*

Claim 8 requires planarizing a contact to make it substantially coplanar with a surface of an insulating material. Sandhu's prior art figure 1 shows such a structure (contact 3 substantially coplanar with the insulating material on each side of it).

The appellant questions why one of ordinary skill in the art would have been motivated to use the prior art configuration disclosed by Sandhu when Sandhu teaches away from it (brief, page 8; reply brief, page 3). Sandhu teaches that he seeks to provide increased density, decreased contact resistance between

an electrode and a barrier layer, and reduced degradation of the barrier layer compared to the prior art device (col. 2, lines 33-38), but he does not disclose that the prior art device is not functional. Hence, Sandhu and Hosaka would have fairly suggested, to one of ordinary skill in the art, the use of Hosaka's method when making the prior art device disclosed by Sandhu to improve the prior art device in the manner taught by Hosaka, i.e., to remove surface roughness and distortions in the lower electrode (1) and round the corner portions of the lower electrode's side surface to prevent degradation of the quality of the thin insulating film formed on the lower electrode and to obtain good electrical characteristics (page 3).

We therefore affirm the rejection of claim 8 and claim 11 that stands or falls therewith.

*DECISION*

The rejection of claims 2 and 4-11 over Sandhu in view of Hosaka is affirmed.

*AFFIRMED*

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| TERRY J. OWENS<br>Administrative Patent Judge | ) | |
| JOSEPH F. RUGGIERO<br>Administrative Patent Judge | ) | BOARD OF PATENT APPEALS AND INTERFERENCES |
| JOSEPH L. DIXON<br>Administrative Patent Judge | ) | |

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