

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ANTONIO L. P. ROTONDARO, LUIGI COLOMBO,
MARK R. VISOKAY, RAJESH KHAMANKAR, and
DOUGLAS E. MERCER

Appeal 2008-3863
Application 10/349,686
Technology Center 2800

Decided: September 19, 2008

Before TERRY J. OWENS, ROMULO H. DELMENDO, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

The Appellants appeal from a rejection of claims 1, 2 and 4. Claim 3, which is the only other pending claim, stands withdrawn from consideration by the Examiner.

THE INVENTION

The Appellants claim an integrated circuit comprising transistors with gate dielectrics of surface-nitrided silicate. Claim 1 is illustrative:

1. An integrated circuit, comprising:

(a) a plurality of interconnected transistors, said transistors with gate dielectrics of surface-nitrided silicate.

THE REFERENCES

Tsunashima	US 2001/0023120 A1	Sep. 20, 2001
Moise	US 2003/0030084 A1	Feb. 13, 2003
(filed Aug. 8, 2001)		

THE REJECTIONS

The claims stand rejected as follows: claims 1, 2 and 4 under 35 U.S.C. § 102(a) over Tsunashima; claims 1 and 2 under 35 U.S.C. § 102(e) over Moise; and claim 4 under 35 U.S.C. § 103 over Moise in view of Tsunashima.

OPINION

We reverse the Examiner's rejections.

Claim interpretation – meaning of “surface nitrided silicate”

During patent prosecution, claims are to be given their broadest reasonable interpretation consistent with the Specification, as the claim language would have been read by one of ordinary skill in the art in view of the Specification. *See In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989); *In re Sneed*, 710 F.2d 1544, 1548 (Fed. Cir. 1983).

The Appellants state that they form a silicon nitride diffusion barrier at the top of a silicate gate dielectric by remote plasma nitridation wherein N₂^{*} reacts with the surface silicate and the nitridation time is limited to form only about two monolayers of silicon nitride (Spec. 5). The Examiner has

not provided evidence that the term “surface-nitrided silicate” has been given a broader meaning in the art than that indicated by the Appellants. Hence, we interpret “surface-nitrided silicate” as meaning that a silicate has had about two monolayers of silicon nitride formed on its surface by nitridation.

Rejection over Tsunashima

Claim 1, which is the sole independent claim, requires gate dielectrics of surface-nitrided silicate.

Tsunashima discloses a metal silicate film (6) doped with nitrogen to increase its dielectric constant (¶ 0082). Tsunashima teaches (¶ 0069):

When nitrogen is contained in metal silicate film 6, it is preferable to set the amount of nitrogen contained in metal silicate film 6 to about from $1 \times 10^{14} \text{ cm}^{-2}$ to about $1 \times 10^{15} \text{ cm}^{-2}$ when the total number of atoms is expressed in terms of surface density. Particularly, it is desirable to set the number of atoms so as to have the concentration peak in a position near the interface with the silicon substrate 1.

The Examiner argues that Tsunashima discloses gate dielectric 6 of surface nitrided silicate (Ans. 3), and that (Ans. 5-6)

first, the claimed language does not specifically state which surface is nitrided (upper, lower, or side surface). Second, Tsunashima et al. clearly states at section [0069] that nitrogen contains in metal silicate (6) in terms of surface density. Tsunashima et al. further states that it is desirable to set the number of atoms so as to have the concentration peak in a position near the interface with silicon substrate (1).

As indicated by Tsunashima’s Figure 1A, the interface between metal silicate 6 and substrate 1 that is to have the peak nitrogen concentration is on the side of metal silicate film 6 opposite to the side through which the

dopant nitrogen enters that metal silicate film. Tsunashima does not disclose, and the Examiner has not established, that the doping results in a “surface-nitrided silicate” as that term is most broadly construed in light of the Appellants’ Specification as set forth above.

The Examiner, therefore, has not established a *prima facie* case of anticipation of the Appellants’ claimed invention by Tsunashima.

Rejection over Moise

Moise discloses a gate dielectric (38) that “may be formed from silicon dioxide, an oxynitride, a silicon nitride, BST , PZT, a silicate, any other high-k material, or any combination or stack thereof” (¶ 0034).

The Examiner argues that the above disclosure by Moise is a disclosure of a gate dielectric that “is a stack of silicon nitride and silicate” (Ans. 4). The Examiner argues (Ans. 7):

[T]he instant application at page 5, section (3), the last 7 lines show that, after reaction, the silicon nitride will be formed on the silicate. This implies that the gate dielectric of the present invention also is a stack of silicate and silicon nitride. Therefore, it does not distinguish over the Moise et al. reference which also discloses that gate dielectric (38) is a stack of silicon nitride and a silicate.

The Appellants’ Specification does not disclose that the gate dielectric is a stack of silicon nitride and a silicate but, rather, discloses that the gate dielectric is a silicate having on its surface about 2 monolayers of silicon nitride that function as a diffusion barrier (Spec. 5). Moise’s silicon nitride is a layer of a stack that forms the gate dielectric (¶ 0034). The Examiner has not established that a silicon nitride layer of a gate dielectric stack is sufficiently thin to fall within “surface-nitrided silicate” as that term is most

Appeal 2008-3863
Application 10/349,686

broadly construed in view of the Appellants' Specification as set forth above.

Hence, the Examiner has not established a prima facie case of anticipation of the Appellants' claimed invention by Moise.

Rejection over Moise in view of Tsunashima

The Examiner does not rely upon Moise or Tsunashima for any disclosure that would have rendered prima facie obvious, to one of ordinary skill in the art, a surface-nitrided silicate as required by claim 1 from which claim 4 depends (Ans. 4).

Thus, the Examiner has not established a prima facie case of obviousness of the invention claimed in the Appellants' claim 4.

DECISION

The rejections of claims 1, 2 and 4 under 35 U.S.C. § 102(a) over Tsunashima, claims 1 and 2 under 35 U.S.C. § 102(e) over Moise, and claim 4 under 35 U.S.C. § 103 over Moise in view of Tsunashima are reversed.

REVERSED

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