

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

Paper No. 39

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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***Ex parte*** JUNICHI SATO

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Appeal No. 1998-2669  
Application 08/283,253

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HEARD: April 24, 2001

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This is a decision on an appeal from the final rejection of claims 8-11, 13-15, and 17-28, which are all of the claims remaining in the application.

The subject matter on appeal relates to a method of manufacturing a semiconductor device which includes the steps of forming a first film of pure metal by chemical vapor

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deposition and without exposing the first film to air successively forming a second film by chemical vapor deposition on the first film,

wherein the second film is a metal oxynitride and the metal of this compound constitutes the metal used to form the first film. Further details of this appealed subject matter are set forth in representative independent claim 8, which reads as follows:

8. A method of manufacturing a semiconductor device comprising the steps of providing a semiconductor substrate having a patterned insulating layer formed on a surface thereof, the insulating layer being patterned to form at least one contact hole defining side walls of said insulating layer and an exposed portion of the surface of said semiconductor substrate; forming a first film by a first chemical vapor deposition to cover the patterned insulating layer, the side walls and the exposed portion, the first film being a pure metal selected from a group consisting of titanium, tungsten, molybdenum, hafnium, and zirconium; without exposing the first film to air, successively forming a second film by a second chemical vapor deposition on the first film, said second film being a metal oxynitride and the metal of the compound being the metal used to form the first film; and then forming a tungsten film on the second film to fill each contact hole with the tungsten film, said first and second chemical vapor depositions being performed using a gas consisting of a halogen and said metal.

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The prior art set forth below is relied upon by the examiner as evidence of obviousness:

Sarin	4,943,450	July 24, 1990
Kawakami	5,099,790	Mar. 31, 1992
Sandhu et al. (Sandhu)	5,173,327	Dec. 22, 1992
Hirose et al. (Hirose)	5,203,959	Apr. 20, 1993
Asahina	5,342,806	Aug. 30, 1994

Kumar et al. (Kumar), "Growth and Properties of TiN and TiO<sub>x</sub>N<sub>y</sub> Diffusion Barriers in Silicon on Sapphire Integrated Circuits," *Thin Solid Films*, 287-301 (1987).

The admitted prior art described by the appellant on pages 1-3 of the subject specification.

The following rejections under 35 U.S.C. § 103 are before us on this appeal:

Claims 8, 9, 13, 14, 17-19, 21, 23, and 24 stand rejected over the admitted prior art in view of Kumar or Asahina and further in view of Hirose.

Claims 11 and 15 stand rejected over the admitted prior art in view of Kumar and further in view of Hirose and further in view of Sandhu.

Claim 10 stands rejected over the admitted prior art in view of Kumar and further in view of Hirose and further in view of Sarin.

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Claims 20, 22, 25, and 26 stand rejected over the admitted prior art in view of Kumar or Asahina and further in view of Hirose and further in view of Kawakami.

Finally, claims 27 and 28 stand rejected over the prior art listed immediately above and further in view of Sandhu.

We refer to the brief and reply brief and to the answer for a complete exposition of the opposing viewpoints expressed by the appellant and by the examiner concerning the above-noted rejections.

***OPINION***

We will not sustain any of the rejections advanced by the examiner on this appeal.

All of the appealed claims distinguish over the admitted prior art by requiring that the first film be formed by chemical vapor deposition and without exposing the first film to air successively forming a second film by chemical

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vapor deposition on the first film. In contrast, the admitted prior art applies the first (*i.e.*, the Ti) film by sputtering and then a second (*i.e.*, the TiON) film according to a chemical vapor deposition process. With respect to each of the rejections before us, it is the examiner's position that

it would have been obvious for one skilled in the art at the time the invention was made to have substituted Hirose et al's (5,203,959) ECR-CVD thin film depositing method for the sputtering thin film method of the [admitted] prior art because of the advantages associated with its use as evidenced above, *i.e.* higher through put (Answer, page 6).

As for the claim requirement of successively forming the second film "without exposing the first film to air," the examiner argues that "Hirose . . . teaches performing the ECR/CVD in a vacuum" and "this clearly suggests to one skilled in the art that the deposition process is performed with [sic, without] 'exposure' to air" (Answer, page 12).

The examiner's position is not well taken. As correctly argued by the appellant, the Hirose disclosure is limited to forming only a single film by chemical vapor

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deposition. We find nothing and the examiner points to nothing in this disclosure which would have suggested successively forming first and second films by chemical vapor deposition much less of forming these films without exposing the first film to air. These last mentioned features are disclosed only in the appellant's specification. Thus, we are constrained to regard the examiner's obviousness conclusion as being based on impermissible hindsight derived from the appellant's own disclosure rather than being based upon a teaching, suggestion, or incentive derived from the applied prior art.

The examiner has not relied upon any of the other applied references for a teaching or suggestion of the aforementioned claim features. It follows that the previously discussed deficiency in the examiner's obviousness conclusion

taints each of the rejections advanced on this appeal. As a consequence, we will not sustain any of these rejections.

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The decision of the examiner is reversed.

**REVERSED**

BRADLEY R. GARRIS	)	
Administrative Patent Judge	)	
	)	
	)	
	)	BOARD OF PATENT
THOMAS A. WALTZ	)	APPEALS AND
Administrative Patent Judge	)	INTERFERENCES
	)	
	)	
	)	
BEVERLY A. PAWLIKOWSKI	)	
Administrative Patent Judge	)	

BRG:psb

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