

The opinion in support of the decision being entered today was not written for publication in a law journal and is not binding precedent of the Board.

Paper No. 21

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte SHU-YUAN YANG  
and  
CHAUCER CHUNG

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Appeal No. 2004-0216  
Application No. 09/460,112

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ON BRIEF

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Before KIMLIN, GARRIS and JEFFREY T. SMITH, Administrative Patent Judges.

KIMLIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-14.

Claim 1 is illustrative:

1. A method for forming a shallow trench isolation using a SiON anti-reflective coating which eliminates water spot defects, comprising the steps of:

- a. forming a pad oxide layer over a substrate;
- b. forming a silicon nitride layer on said pad oxide layer;

Appeal No. 2004-0216  
Application No. 09/460,112

- c. forming a silicon oxynitride layer on said silicon nitride layer;
- d. forming a photoresist mask over said silicon oxynitride layer; said photoresist mask having an opening;
- e. etching a trench in said silicon oxynitride layer, said silicon nitride layer, said pad oxide layer and said substrate through said opening in said photoresist mask;
- f. removing said photoresist mask;
- g. removing said silicon oxynitride layer;
- h. cleaning said substrate with a solution comprising  $\text{NH}_4\text{OH}$ ,  $\text{H}_2\text{O}$ , and  $\text{H}_2\text{O}_2$ , wherein water spots are prevented by the absence of silicon oxynitride;
- i. growing a thin silicon oxide layer and depositing a silicon oxide layer in said trench; and
- j. planarizing said silicon oxide layer to form a shallow trench isolation.

The examiner relies upon the following references as evidence of obviousness:

Cheng et al. (Cheng)	6,001,704	Dec. 14, 1999
Chau et al. (Chau)	6,087,236	Jul. 11, 2000
Wu	6,020,230	Feb. 01, 2000
Fulford, Jr. et al. (Fulford)	6,051,510	Apr. 18, 2000

Appellants' claimed invention is directed to a method for forming a shallow trench isolation (STI) using a silicon oxynitride (SiON) anti-reflective coating (ARC). The method entails removing the SiON layer before cleaning the substrate with a solution comprising  $\text{NH}_4\text{OH}$ ,  $\text{H}_2\text{O}$  and  $\text{H}_2\text{O}_2$ . According to appellants, they have found that the SiON layer reacts with the

Appeal No. 2004-0216  
Application No. 09/460,112

cleaning solution and causes a contamination problem which results in high defect rates. Accordingly, appellants remove the SiON layer before cleaning to prevent the contamination.

Appealed claims 1-14 stand rejected under 35 U.S.C. § 103 as being unpatentable over Wu in view of Cheng, Fulford and Chau.

We have thoroughly reviewed the respective positions advanced by appellants and the examiner. In so doing, we find that the examiner has failed to establish a prima facie case of obviousness for the claimed subject matter. Accordingly, we will not sustain the examiner's rejection.

The examiner appreciates that Wu, in forming an STI, does not disclose the use of an SiON layer. According to the examiner, it would have been obvious for one of ordinary skill in the art to use the SiON layer of Cheng as the oxide layer in Wu formed on the nitride layer. As for removing the SiON layer before cleaning the substrate, the examiner maintains that "Chau discloses a method in which the wafer is cleaned in the absence of a silicon oxynitride layer" (page 7 of Answer, third paragraph). Appellants, on the other hand, counter that Chau teaches cleaning the substrate while the remaining oxynitride layer (106) is still intact on the substrate and, therefore, Chau teaches away from the claimed invention (page 12 of Brief, second

Appeal No. 2004-0216  
Application No. 09/460,112

paragraph). In response to appellants' argument, the examiner cites column 5, lines 32-60 of Chau and explains that "[t]he first part of the process removes some of the oxynitride layer and then a second etch is used to remove the remaining layer" (page 8 of Answer, fourth paragraph). The examiner also cites column 6, lines 1-14 of Chau.

Our review of Chau finds us in agreement with appellants to the extent that the examiner factually errs in stating that "Chau discloses a method in which the wafer is cleaned in the absence of a silicon oxynitride layer" (page 7 of Answer, third paragraph). Contrary to the examiner's position, it is quite clear from the paragraph bridging columns 5 and 6 of Chau, and accompanying Figures 1-6, that Chau cleans after the photoresist is removed and the patterned SiON layer (106) is present on the substrate. Accordingly, the examiner's conclusion that the combined teachings of the prior art result in the inherent removal of water spots lacks the requisite factual support.

Appeal No. 2004-0216  
Application No. 09/460,112

In conclusion, based on the foregoing, the examiner's  
decision rejecting the appealed claims is reversed.

REVERSED

EDWARD C. KIMLIN	)	
Administrative Patent Judge	)	
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	)	
	)	
BRADLEY R. GARRIS	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
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	)	
JEFFREY T. SMITH	)	
Administrative Patent Judge	)	

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Appeal No. 2004-0216  
Application No. 09/460,112

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