UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex Parte ANGELA T. HUI, JUSUKE OGURA, and YIDER WU

Appeal No. 2006-2728
Application No. 10/799,413

ON BRIEF

Before HAIRSTON, KRASS and HOMERE, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1 through 5 and 10 through 15.

The disclosed invention relates to a method for avoiding oxide gouging in shallow trench isolation (STI) regions of a semiconductor device.

Claim 10 is illustrative of the claimed invention, and it reads as follows:

10. A method for avoiding oxide gouging in shallow trench isolation (STI) regions of a semiconductor device comprising the steps of:

etching a trench in an STI region;

filling said trench with an insulating material;

depositing an anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region;

etching a portion of said anti-reflective coating layer over said STI region leaving a remaining portion of said anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region; and

depositing a protective cap covering said STI region and extending beyond the boundaries of said STI region, wherein said protective cap covers said remaining portion of said anti-reflective coating layer and said insulating material over said STI region.

The references relied on by the examiner are:

Tripsas et al. (Tripsas)	6,034,395	Mar. 07, 2000
Yang et al. (Yang)	6,110,779	Aug. 29, 2000
Hsu et al. (Hsu)	6,197,637	Mar. 06, 2001

Claims 1 through 5 and 10 through 15 stand rejected under the second paragraph of 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

Claims 10, 11, 14 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hsu in view of Yang.

Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hsu in view of Yang and Tripsas.

Reference is made to the briefs and the answer for the respective positions of the appellants and the examiner.

OPINION

We have carefully considered the entire record before us, and we will reverse the indefiniteness rejection of claims 1 through 5 and 10 through 15, sustain the obviousness rejections of claims 10 and 15 and reverse the obviousness rejections of claims 11 through 14.

Turning first to the indefiniteness rejection, the examiner is of the opinion (answer, pages 3 through 5) that etching of the anti-reflective coating layer, the polysilicon layer and the gate oxide layer would remove the layers as a whole, and that none of the layers would remain "leaving a remaining portion . . . over said STI region and extending beyond the boundaries of said STI region."

According to the appellants (brief, pages 5 through 10), Figures 3B and 3C and page 8, lines 1 through 7 of the disclosure illustrate and describe how each of the noted layers is etched "leaving a remaining portion . . . over said STI region and extending beyond the boundaries of said STI region."

We agree with the appellants' arguments. The referenced portion of the disclosure indicates that the anti-reflective coating layer 34, the polysilicon layer 32 and the gate oxide layer 30 are etched "over a portion of the STI region," and the referenced figures of the drawing clearly show that a portion of each layer remains "over" the STI region (i.e., trench 14), and that each layer extends "beyond" the boundaries of the STI region. None of the disclosed etching steps removes a layer as a whole.

The examiner's contention that the claim 1 phrase "etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region" lacks antecedent basis because "[n]either the polysilicon nor the gate oxide **have been exposed**, because the anti-reflective coating layer is still remaining over the STI region and extending beyond the boundaries of the STI region" is without merit in view of the referenced portion of the disclosure and the referenced figures of the drawing noted supra. Figure 3B of the drawing

clearly shows the polysilicon layer 32 exposed through the hole in the mask layer 36.

In summary, the indefiniteness rejection of claims 1 through 5 and 10 through 15 is reversed because the claims on appeal do, in fact, set out and circumscribe a particular area with a reasonable degree of precision and particularity when read in light of the application disclosure as they would be by one possessing ordinary skill in the art. In re Moore, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971).

Turning next to the obviousness rejection of claims 10 and 15, we agree with the examiner's findings (answer, pages 5 through 7) that Hsu teaches a method that avoids oxide gouging in isolation regions of a semiconductor device. Hsu teaches that the isolation regions 230 can be formed either as the isolation regions or as shallow trench isolation (STI) regions (column 3, lines 31 through 35). Accordingly, Hsu teaches an alternative embodiment that avoids oxide gouging in shallow trench isolation (STI)[1] regions 230 as claimed. The shallow trench isolation regions are filled with an insulating material (e.g., thermal oxide[2]) (column 3, lines 31 through 35). We additionally agree with the examiner's findings that an anti-reflective coating (ARC) 241a is deposited over the trench regions, and that the ARC 241a extends beyond the boundaries of the trench regions (Figure 5B; column 3, lines 42 through 48). Thereafter, Hsu etches portions 242 of the ARC 241a over each of the trench regions (Figure 5B; column 3, lines 42 through 51 "leaving a remaining portion of said anti-reflective coating layer over said STI region and extending beyond the boundaries

[1] The STI teachings of Yang (Figure 4; column 6, lines 24 through 26) are merely cumulative to the teachings of Hsu.
2 Appellants acknowledge (specification, page 1) that thermal silicon oxide is used to fill the trenches.

of said STI region" as claimed. Finally, Hsu deposits a protective cap 246 (Figure 5C; column 3, lines 59 through 61) "covering said STI region and extending beyond the boundaries of said STI region, wherein said protective cap covers said remaining portion of said anti-reflective coating layer and said insulating material over said STI region" as claimed. Thus, the obviousness rejection of claims 10 and 15 is sustained because Hsu teaches all of the method steps of claims 10 and 15. In sustaining a multiple reference rejection under 35 U.S.C. § 103, the Board may rely on one reference alone without designating it as a new ground of rejection. In re Bush, 296 F.2d 491, 496, 131 USPQ 263, 266-67 (CCPA 1961); In re Boyer, 363 F.2d 455, 458, n.2, 150 USPQ 441, 444, n.2 (CCPA 1966).

The obviousness rejection of claims 11 and 14 is reversed because neither Hsu nor Yang teaches or would have suggested to the skilled artisan to use an etching step in lieu of the chemical mechanical polishing planarization of the protective cap layer 246 (column 4, lines 5 through 12).

The obviousness rejection of claims 12 and 13 is reversed because the applied references neither teach nor would have suggested to the skilled artisan to use a photoresist material in lieu of the oxide protective cap layer 246 (column 5, lines 3 and 4).

DECISION

The decision of the examiner rejecting claims 1 through 5 and 10 through 15 under the second paragraph of 35 U.S.C. § 112 is reversed, and the decision of the examiner

rejecting claims 10 through 15 under 35 U.S.C. § 103(a) is affirmed as to claims 10 and 15, and is reversed as to claims 11 through 14.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

KENNETH W. HAIRSTON Administrative Patent Judge	)
ERROL A. KRASS Administrative Patent Judge	) **BOARD OF PATENT**) **APPEALS AND**) **INTERFERENCES**
JEAN R. HOMERE Administrative Patent Judge	)

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