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D E C I S I O N
of 31 May 2000

Case Number: T 0068/96 - 3.4.3

Application Number: 90305365.0

Publication Number: 0398730

IPC: H01L 21/76

Language of the proceedings: EN

Title of invention:
Method of forming planar isolation regions

Applicant:
MOTOROLA INC.

Opponent:
-

Headword:
Isolation region/MOTOROLA

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
-

Decisions cited:
-

Catchword:
-

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Case Number: T 0068/96 - 3.4.3

D E C I S I O N
of the Technical Board of Appeal 3.4.3
of 31 May 2000

Appellant: MOTOROLA INC.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 16 August 1995 refusing European patent application No. 90 305 365.0 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: R. K. Shukla
Members: G. Eliasson
M. J. Vogel

Summary of Facts and Submissions

I. European patent application 90 305 365.0 was refused in a decision of the examining division dated 16 August 1995. The ground for the refusal was that the subject matter of claims 1 to 10 did not involve an inventive step having regard to prior art documents

D1: EP-A-0 272 491;

D2: Journal of the Electrochemical Society, Vol. 135, No. 10, October 1988, pages 2562 to 2566;

D3: US-A-4 526 631;

D4: Motorola Technical Developments, Vol. 8, October 1988, pages 51 to 52; and

D5: EP-A-0 172 772.

II. The appellant (applicant) lodged an appeal on 12 October 1995, paying the appeal fee the same day. A statement of the grounds of appeal was filed on 21 December 1995 together with new claims 1 to 6. The appellant indicated that the amendments to claim 1 were supported in the application as filed by the description on page 7, lines 13 to 20 and Figure 12.

The appellant requested that the decision under appeal be set aside and that a patent be granted based on the claims 1 to 6 filed with the statement of the grounds of appeal. In case the above request would not be granted, the appellant requested oral proceedings.

III. In a communication dated 23 September 1999, the Board informed the appellant of its provisional opinion that claim 1 did not appear to meet the requirements of Articles 123(2) and 84 EPC. Since the appellant did not respond to the above communication within the set time limit, the Board issued a summons for oral proceedings on 31 March 2000. The acknowledgment of the receipt of the summons by the Representative of the appellant was received in the office on 13 April 2000.

IV. Oral proceedings were held on 31 May 2000. The Representative of the appellant did not appear at the oral proceedings although he was duly summoned.

V. Claim 1 of the appellant's request reads as follows:

"1. A method of forming isolation regions in semiconductor structures comprising the steps of:

providing a body of semiconductor material (58);

forming a buried layer (56) in said body of semiconductor material (58);

forming a dielectric layer (72) on said body of semiconductor material (58);

patterning and etching a trench (54) through said dielectric layer (72) and into said body of semiconductor material (58), through said buried layer (56);

forming a trench liner layer (62) in said trench (54);

removing said trench liner layer (62) excepting that disposed on the sidewalls of said trench (54) so that semiconductor material is exposed in the bottom of said trench (54);

forming a channel stop region (60) in said body of semiconductor material (58) through said trench (54);

selectively forming polycrystalline silicon (68) on the exposed semiconductor material in said trench (54); and

oxidizing a portion (70) of said polycrystalline silicon (68) in said trench (54)."

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.

2. *Amendments*

2.1 Claim 1 includes the step of "forming a dielectric layer (72) on said body of semiconductor material (58)". Thus, the dielectric layer (72) as defined in claim 1 under consideration can consist of a layer of only one dielectric material, whereas in the corresponding process step in claim 1 as originally filed, it is specified that the dielectric layer comprises "at least one layer (16, 20) of a first dielectric material and at least one layer (18) of a second dielectric material".

Although "a dielectric layer" is mentioned in connection with an embodiment of the invention on page 2, lines 27 to 37 of the application as filed, this statement is at variance with the statement of the invention which according to page 2, lines 15 to 17 is defined by claim 1 which specifies at least two dielectric layers. Moreover, the method described in conjunction with Figures 1 to 11, which is the only method described in detail in the application as filed, discloses three layers 16, 18, 20 made of silicon

oxide, silicon nitride, and silicon oxide, respectively (cf. Figures 1 and 2; page 4, lines 7 to 18). The embodiment of Figure 12, indicated as support for the amendment by the appellant, is only described in terms of how the final structure differs from that of Figure 11. It appears that the device depicted in Figure 12 is produced using the method described in conjunction with Figures 1 to 11 but with the modifications that firstly, the trench has to be deeper than that depicted in Figure 2, secondly, a channel stop region 60 is implanted in the bottom of the trench, and thirdly, the polysilicon layer 68 is only partially oxidized (cf. page 7, lines 13 to 20). None of the above modifications, however, affect the three-layer dielectric layer structure 16, 18, 20 shown in Figure 1 of the application as filed.

Thus, the Board is unable to find any basis in the application documents as filed for the above amendment.

2.2 Claim 1 furthermore specifies that a "trench liner layer (62)" is formed in the trench (54), without any further specification of the trench liner layer. Claim 1 as originally filed, on the other hand, specifies that the trench liner layer is comprised of the first dielectric material, ie. one of the dielectric materials mentioned under item 2.1 above.

The embodiments of Figures 1 to 11 and 12 both show a trench liner layer composed of an oxide layer 24, 64 and a nitride layer 26, 66 (cf. page 4, lines 29 to 33; page 7, lines 16 to 17). Thus, the application as filed consistently discloses a trench liner layer comprising a dielectric layer, and there is no basis in the application as filed for the amendment that the trench

liner layer may not comprise a dielectric layer.

2.3 The appellant had in the statement of grounds of the appeal stated that the amendments of claim 1 were based on Figure 12 and page 7, lines 13 to 20. No further arguments were presented by the appellant who neither responded to the communication of the Board dated 23 September 1999 nor was present at the oral proceedings.

2.4 For the above reasons which were communicated to the appellant in the above-mentioned communication, the Board finds that the requirements of Article 123(2) EPC are not met.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Spigarelli R. K. Shukla