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

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RICKY S. AMOS, ARNE W. BALLANTINE, GREGORY BAZAN, BOMY A. CHEN, DOUGLAS D. COOLBAUGH, HEIDI L. GREER, HERBERT L. HO, JOSEPH F. KUDLACIK, BERNARD P. LEROY, PAUL C. PARRIES, and GARY L. PATTON

Appeal No. 2007-0377
Application No. 10/151,897
Technology Center 2800

Decided: March 19, 2007

Before KENNETH W.HAIRSTON, MAHSHID D. SAADAT, and JEAN R. HOMERE, *Administrative Patent Judges*.

SAADAT, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 60-82, which are all of the claims pending in this application.

We affirm.

BACKGROUND

Appellants' invention is directed to a process for producing a thermally stable contact structure between a region of monocrystalline semiconductor and a region of polycrystalline semiconductor. An understanding of the invention can be derived from a reading of exemplary independent claims 60 and 78, which are reproduced as follows:

> 60. A semiconductor device, comprising:
> a region of monocrystalline semiconductor;
> a region of non-monocrystalline semiconductor having a plurality of crystals therein; and
> interface layers between at least a portion of the monocrystalline semiconductior region and a region of the non-monocrystalline semiconductor region, and between one or more of the plurality of crystals within the region of non-monocrystalline semiconductor,
> said interface layers being adapted and arranged to control a grain growth of the non-monocrystalline semiconductor region.

> 78. A semiconductor device, comprising:
> a monocrystalline semiconductor region;
> a polycrystalline semiconductor region; and
> interface means for controlling a tunneling current between the monocrystalline and polycrystalline semiconductor regions.

The Examiner relies on the following prior art references:

Nicollian	US 5,051,786	Sep. 24, 1991
Saito	US 5,104,694	Apr. 14, 1992
Hsue	US 5,585,656	Dec. 17, 1996

Schrems	US 6,068,928	May 30, 2000
Schrems	US 6,329,703 B1	Dec. 11, 2001

S. M. Sze (Sze), "VLSI Technology," McGraw-Hill Book Company, 1983, pp. 17-18, 103-105.

The claim rejections under appeal are:

Claims 78-80 and 82 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Hsue.

Claims 60-64, 66, 67, and 69-73 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Schrems '703 and Sze.

Claim 65 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Schrems '703 and Sze.

Claims 68, 74, and 75 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Schrems '703, Sze and Schrems '928.

Claims 76 and 77 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Schrems '703, Sze and Nicollian.

Claim 81 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Hsue and Saito.

Rather than reiterate the opposing arguments, we refer to the briefs and the answer for the respective positions of Appellants and the Examiner. Only those arguments actually made by Appellants have been considered in this decision. Arguments which Appellants could have made but chose not to make in the briefs have not been considered (37 C.F.R. § 41.37(c)(1)(vii)).

OPINION

35 U.S.C. § 102 Rejection

Regarding the rejection of claims 78-80 and 82, Appellants assert that tunnel oxide 20 of Hsue does not control any tunneling current and even if tunneling takes place, it would be between LDD region 18 and floating gate 28, and not between a monocrystalline and a polycrystalline region (Br. 10). The Examiner responds that controlling electron tunneling is the basic function of the tunnel oxide in the EEPROM of Hsue (Answer 10). The Examiner further argues that the tunneling is between the polycrystalline layer 28 and the monocrystalline substrate since LDD region 18 is a part of substrate 10 and is indeed a monocrystalline region (*Id.*).

A rejection for anticipation requires that the four corners of a single prior art document describe every element of the claimed invention, either expressly or

inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation. *See Atlas Powder Co. v. IRECO Inc.*, 190 F.3d 1342, 1347, 51 USPQ2d 1943, 1947 (Fed. Cir. 1999); *In re Paulsen*, 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).

After a review of Hsue, we agree with the Examiner that tunnel oxide 20 controls the tunneling current between the monocrystalline and the polycrystalline regions. Hsue describes the substrate as a monocrystalline silicon (col. 2, ll. 41-44) in which the lightly doped drain (LDD) areas 18 are formed (col. 2, ll. 52-57). Although impurities are introduced into substrate 10 for forming the drain regions, contrary to Appellants' assertion (Reply Br. 2), the single crystal structure of the substrate in the doped areas does not change since low levels of implant dose and energy are used, i.e., 1 E ^{13} to 5 E ^{13} atoms/cm^2 at an energy of 40-80 KeV (col. 2, ll. 55-57).

In view of the analysis above, we find that Hsue prima facie anticipates claim 78 as the reference teaches all the recited features. Accordingly, the 35 U.S.C. § 102(e) rejection of claim 78, as well as claims 79, 80, and 82, argued together with claim 1 as one group, over Hsue is sustained.

35 U.S.C. § 103 Rejection

With respect to the rejection of claims 60-64, 66, 67, and 69-73, the Examiner relies on Schrems '703 for teaching the interface layers as SiO_2 precipitations in the polycrystalline and on Sze for teaching the presence of such dopant at the grain boundary in the polycrystalline silicon (Answer 4-6). Appellants argue that Sze teaches against its combination with Schrems '703 since Sze identifies the precipitates as undesirable as they act as sites for dislocation generation (Br. 14). Therefore, the issue is whether the combination of Schrems '703 and Sze suggests interface layers between the crystals of the polycrystalline region to control the grain growth in that region.

Schrems '703 teaches that the presence of SiO_2 dopant precipitations limits the grain growth in the polycrystalline region (col. 5, ll. 32-39) while the density of such dopant precipitations is greater in the vicinity of the interface between the monocrystalline and the non-monocrystalline region of buried strap 16 (col. 6, ll. 35-40). Sze, teaches that when dopant concentration in diffused polysilicon exceeds the solid solubility, excess dopant segregates at the grain boundaries (Sze 103-104). Additionally, we find Appellants' arguments (Br. 13; Reply Br. 4) contrasting the interfacial layers shown in Appellants' Figure 4 with the teachings

of Schrems ‘703 unpersuasive since Figure 4 merely describes a microscopic view of the interface layers in the polycrystalline region consistent with the teachings of Sze. In that regard, as pointed out by the Examiner (Answer, 12), Sze teaches that the dopant precipitations in Schrems ‘703 are formed at the grain boundaries and control the grain growth in the non-monocrystalline region.

With regard to Appellants’ assertion (Br. 15-16) that Sze teaches against the combination by considering the precipitations as undesirable, we observe that the undesirability relates to crystal growth (Sze 18) which is what Schrems ‘703 is also trying to avoid for forming the proper interface between monocrystalline and the polycrystalline regions. Therefore, Sze teaches the concentration of the precipitants at the grain boundary and reinforces the goal of controlling the grain growth to achieve improved contact structure between the monocrystalline and the polycrystalline regions.

Based on the presented arguments, the weight of evidence in support of each side and our findings above, we find the Examiner’s case of prima facie obviousness to be reasonable. Therefore, we, sustain the 35 U.S.C. § 103 rejection of claims 60-64, 66, 67, and 69-73 over Schrems ‘703 and Sze.

With respect to the rejection of the remaining claims, we note that Appellants merely rely on the same arguments addressed above and assert that the additional references relied on for rejecting the claims fail to make up for the identified deficiencies of Schrems '703 and Sze (Br. 16-19). Based on our findings above and the weight of arguments presented by Appellants and the Examiner's response, we sustain the 35 U.S.C. § 103 rejection of claim 65 over Schrems '703, Sze and Saito, of claims 68, 74, and 75 over Schrems '703, Sze and Schrems '928, of claims 76 and 77 over Schrems '703, Sze, and Nicollian and of claim 81 over Hsue and Saito.

CONCLUSION

In view of the foregoing, the decision of the Examiner rejecting claims 78-80 and 82 under 35 U.S.C. § 102 and claims 60-77 and 81 under 35 U.S.C. § 103 is affirmed.

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

AFFIRMED

MDS

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