UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte ERIC PATON, PAUL RAYMOND BESSER,
SIMON S. CHAN and DAVID E. BROWN

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Appeal No. 2006-1231
Application No. 10/180,686

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ON BRIEF

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Before OWENS, LEVY, and NAPPI, *Administrative Patent Judges*
OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal is from a rejection of claims 12-15, 17-19 and 29-35, which are all of the pending claims.

THE INVENTION

The appellants claim a semiconductor device having, on an active region, a silicide contact comprising a first metal silicide and an amount of an additional material that causes the formation of that metal silicide to be energetically favored over the formation of a second metal silicide. Claim 12 is illustrative:

12: A device comprising:

a substrate;

a semiconductor device on said substrate, said semiconductor device comprising an active region comprising silicon;

a silicide contact on said active region, said silicide contact comprising a first metal silicide and an additional material, wherein said first metal silicide comprises a metal capable of forming a second metal silicide, wherein an amount of said additional material causes formation of said first metal silicide to be energetically favored over formation of said second metal silicide.

THE REFERENCES

Anjum et al. (Anjum)	5,470,794	Nov. 28, 1995
Cabral, Jr. et al. (Cabral)	2002/0115262	Aug. 22, 2002 (filed Feb. 21, 2001)
Maa et al. (Maa)	6,468,901	Oct. 22, 2002 (filed May 2, 2001)

T. Ohguro et al. (Ohguro), "Nitrogen-doped nickel monosilicide technique for deep submicron CMOS salicide", paper presented at Int'l Electron Devices Meeting, Washington, D.C., Dec. 10-13, 1995, at 453-56.

THE REJECTIONS

The claims stand rejected as follows: claims 12, 14, 15, 18, 29, 31, 32 and 34 under 35 U.S.C. § 102(b) as anticipated by Ohguro; claims 12, 15, 29 and 32 under 35 U.S.C. § 102(b) as anticipated by Anjum; claims 12-15, 17, 18 and 29-34 under

35 U.S.C. § 102(e) as anticipated by Maa; and claims 12-15, 18, 19, 29-32, 34 and 35 under 35 U.S.C. 102(e) as anticipated by Cabral.

OPINION

We affirm the aforementioned rejections.

Ohguro discloses a semiconductor device having a silicide contact comprising nitrogen-doped NiSi (page 453). The disclosed concentration of nitrogen, which is one of the appellants' additional materials, in the NiSi is about 10^{16} to 10^{21} atoms/cm^3 (fig. 2).

Anjum discloses a semiconductor device having germanium, which is one of the appellants' additional materials, implanted into the interface between a metal layer and silicon that are annealed to form metal silicide (col. 3, lines 43-65). The disclosed germanium implant dosage is $1x10^{13}$ to $5x10^{14}$ atoms/cm^2 (col. 7, lines 33-34).

Maa discloses a semiconductor device having NiSi containing an impurity that can be iridium, which is one of the appellants' additional materials (col. 4, lines 31-59). The impurity is added by depositing a 5-20A iridium layer between silicon and a

50-200A nickel layer (col. 6, line 52 - col. 7). The iridium typically is present in the NiSi at less than 15 atomic percent (col. 7, lines 3-7).

Cabral discloses a semiconductor device having an M-Si-Ge alloy layer wherein the Ge, which is one of the appellants' additional materials, is present in an amount of about 2-10 atomic percent (¶¶ 0001 and 0038). In an example the Ge is present at 5 atomic percent (¶ 0067).

The appellants' sole argument is that none of the references teaches that the disclosed material which corresponds to the appellants' additional material is present in an amount that causes formation of a first metal silicide to be energetically favored over formation of a second metal silicide (brief, pages 8-16).

The appellants are incorrect as to Maa who uses an atomic percentage of Ir in NiSi (less than 15 at%, col. 7, lines 3-7) that is essentially the same as that of the appellants (less than about 15 at%, specification, page 3, lines 1-4), and teaches that if the Ir forms a silicide having a structure similar to that of NiSi, one might expect that those silicides can form a mutual

soluble solid solution having a reduced total free energy, thereby reducing the driving force to form $NiSi_2$ (col. 4, lines 36-59). That is the mechanism set forth by the appellants (specification, page 6, line 22 - page 7, line 6).

Moreover, Cabral's Ge is present in Ni-Si-Ge in an amount (about 2-10 at%, 5 at% being exemplified) within the range used by the appellants (less than about 15 at%, such as about 5-10 at%; specification, page 3, lines 1-4). Because Cabral's materials and amounts are the same as those of the appellants, the favoring of NiSi over $NiSi_2$ obtained by the appellants necessarily is obtained by Cabral.

As for Anjum and Ohguro, Anjum discloses a Ge implant dose of $1x10^{13}$ to $5x10^{14}$ atoms/cm^2 (col. 7, lines 33-34), and Ohguro discloses a nitrogen concentration of 10^{17}-10^{21} atoms/cm^3 (fig. 2). The appellants' disclosed ion implant dose is about $1x10^{18}$ to $1.5x10^{18}$ atoms/cm^2 (specification, page 8, lines 11-13). Because the materials of Anjum and Ohguro are the same as those as the appellants, the references provide evidence that, prima facie, the energetic favoring of one metal silicide over another required by the appellants' claims necessarily is obtained. See

In *re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990)("[W]hen the PTO shows sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not."). The appellants do not rely upon evidence for overcoming the prima facie anticipation.

For the above reasons we find that the appellants' claimed invention is anticipated by each of Ohguro, Anjum, Maa and Cabral.

DECISION

The rejections of claims 12, 14, 15, 18, 29, 31, 32 and 34 under 35 U.S.C. § 102(b) over Ohguro, claims 12, 15, 29 and 32 under 35 U.S.C. § 102(b) over Anjum, claims 12-15, 17, 18 and 29-34 under 35 U.S.C. § 102(e) over Maa, and claims 12-15, 18, 19, 29-32, 34 and 35 under 35 U.S.C. 102(e) over Cabral, are affirmed.

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

TERRY J. OWENS Administrative Patent Judge	)	
STUART S. LEVY Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
ROBERT E. NAPPI Administrative Patent Judge	)	

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