

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

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(2) is not binding precedent of the Board.

Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MICHAEL S. LIU
and JAMES C. LAI

Appeal No. 97-1387
Application 08/251,011¹

ON BRIEF

Before HAIRSTON, KRASS, and FLEMING, Administrative Patent
Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of
claims 1 through 4. Claims 5 through 10² have been indicated
by the examiner as being directed to allowable subject matter
and are not on appeal before us.

¹ Application for patent filed May 31, 1994. According to
appellants, this application is a continuation of Application
07/997,864, filed December 29, 1992, now abandoned.

² A rejection of claims 6 and 8 through 10 under 35 U.S.C.

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The invention is directed to a semiconductor device as set forth in independent claim 1, reproduced as follows:

1. A semiconductor device comprising:

a support structure formed of an electrically insulating layer on a semiconductor material base of a first conductivity type;

a plurality of field-effect transistors including first and second field-effect transistors comprising:

first and second semiconductor material substrates for said first and second field-effect transistors, respectively, that are substantially crystalline and provided spaced apart from one another on said electrically insulating layer with each having a central portion thereof of said first conductivity type, said first semiconductor material substrate having a pair of terminating regions of said first conductivity type separated by said central portion thereof each having a greater conductivity than said central portion, said second semiconductor material substrate having a pair of terminating regions of a second conductivity type separated by said central portion thereof;

first and second gate oxide layers provided on at least said first and second semiconductor material substrate central portions, respectively; and

first and second gate semiconductor structures of a common conductivity type provided on said first and second gate oxide layers across from said first and second semiconductor material substrate central portions, respectively.

The examiner relies on the following references:

' 112, second paragraph, was withdrawn by the examiner in the answer.

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Hayashi

2-20060³

Jan. 23, 1990

Malhi et al. (Malhi), "Novel SOI CMOS Design Using Ultra Thin Near Intrinsic Substrate," IEDM 82, pp. 107-10, 1982.

Whitlow et al. (Whitlow), "Mass-dispersive recoil spectrometry studies of oxygen and nitrogen redistribution in ion-beam-synthesized buried oxynitride layers in silicon," App. Phys. Lett., vol. 52, no. 22, pp. 1871-73, 1988.

Claims 1 through 4 stand rejected under 35 U.S.C. ' 103.

As evidence of obviousness, the examiner cites Hayashi in view of Malhi with regard to claims 1, 2 and 4, adding Whitlow to this combination with regard to claim 3.

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

OPINION

With regard to independent claim 1, the examiner takes the position that Hayashi, in Figure 5, discloses all that is claimed [see page 4 of the answer] but for a showing of forming the insulating substrate 102 formed on a p-type silicon supporting substrate. The examiner reasons that since Malhi shows a complementary type thin film FET, as does Hayashi, but shows the transistor formed on an insulating substrate which is then formed on a p-type Si substrate

³ Our understanding of Hayashi is based on an English translation thereof prepared by the United States Patent and

[Figure 5 of Malhi], it would have been obvious "to have the p type silicon supporting substrate of Malhi...in Hayashi because it is a widely use [sic, used] supporting material for [a] thin film transistor" [answer, page 5].

While the examiner's rationale appears reasonable, on its face, appellants make the following arguments:

1. Combining Hayashi and Malhi would defeat the purpose of Hayashi's structure which is intended as a display device switch. Therefore, a wafer substrate positioned as articulated by the examiner "would block the view of the display thereabove" [brief-page 12].
2. The polysilicon transistors of Hayashi would not result if the fabrication process started with the crystalline semiconductor material wafer used by Malhi since the point of starting with a crystalline material is to provide crystalline substrate transistors.
3. Hayashi does not disclose the FETs required by independent claim 1, i.e., that they be "substantially crystalline." On the contrary, Hayashi's transistors are formed in polycrystalline substrates.

Trademark Office. A copy of the translation is attached hereto.

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Regarding appellants' first argument, we are not persuaded that the combination of the Hayashi and Malhi teachings would defeat the purpose of Hayashi's structure "intended as a display device switch" because we find no evidence that that is the purpose of Hayashi. While appellants make the allegation that the intended purpose of Hayashi's structure is a display device switch, appellants have not pointed to anything in Hayashi which provides evidence of this purpose, the examiner concludes that the English translation of Hayashi never discloses the device of Figure 5 to be intended for use in a display device and our independent review of the English translation leads us to the same conclusion. Accordingly, without some evidence that Hayashi discloses what appellants allege it discloses regarding the structure's use in a display device, appellants' argument in this regard is simply not persuasive.

Moving on to appellants' second argument, just because Malhi may start with a crystalline material in order to provide crystalline substrate transistors, this does not lead, inescapably, to the conclusion that the *only* reason the artisan would ever start with a crystalline material is to provide crystalline substrate transistors. As the examiner

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points out at page 6 of the answer, at the end of the only full paragraph, "it is possible to form polycrystalline silicon transistors of Hayashi on the insulator-semiconductor substrate of Malhi" and it was "well known in the art that single crystalline silicon can be recrystallized" by various methods. Now, we realize that merely because something is *possible* or *can be* done does not make it obvious within the meaning of 35 U.S.C. ' 103. However, it is our view that the examiner was merely pointing out that the polysilicon transistors of Hayashi may very well be produced starting from a single crystalline material as a support structure and this is never denied by appellants, appellants' only argument in this regard being that "the very point of forming such a structure is to provide crystalline substrate transistors" [brief-page 12]. Yet, while one reason for employing a single crystalline material base may be to provide crystalline substrate transistors, this may not be the sole reason. There may be a number of reasons why the artisan would employ a single crystalline material base and yet still prefer to provide polycrystalline silicon transistors, based on various characteristics of the materials and the desired goals.

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Therefore, we find appellants' second argument to be unpersuasive.

Turning to the third argument, we, again, agree with the examiner. The term "substantially crystalline" is overly broad. Perhaps appellants intended to use the term "substantially *monocrystalline*." As claimed, and argued, however, it would appear to us that whether a material was monocrystalline or polycrystalline, it would still be "substantially crystalline." Accordingly, for appellants to argue that claim 1 requires that the first and second semiconductor material substrates used in forming the FETs are "substantially crystalline" while the transistors in Hayashi's Figure 5 are formed in a "polycrystalline substrate" is not persuasive since the "polycrystalline substrate" of Hayashi is, indeed, "substantially crystalline." The polycrystalline substrate of Hayashi may not be *monocrystalline* but it is clearly "substantially crystalline," as claimed. If there is a convention in the art or a definition in the instant disclosure which equates "crystalline" with "monocrystalline," appellants have not alluded to any evidence which would indicate this to be the case and we are unaware of any such convention or definition.

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Our interpretation of "substantially crystalline" would also be applicable to appellants' second argument as an alternative reason for finding that argument to be unpersuasive. In other words, since "crystalline," or "substantially crystalline" covers both monocrystalline and polycrystalline materials, appellants' argument, that polysilicon transistors would not result if the fabrication process starts with a "crystalline" semiconductor material wafer, would appear to be in error since the "crystalline" semiconductor material wafer may be monocrystalline or polycrystalline.

Appellants' comments with regard to the background section of the Sarma patent, of record, at page 13 of the brief, are not persuasive since they are directed to things outside the scope of claim 1. Similarly, the argument at page 14 of the brief regarding "dimensional mismatch" is not persuasive since claim 1 indicates no particular dimensions and Hayashi does not appear to be directed, or limited, to display devices, as contended by appellants.

Contrary to appellants' contention, we fail to find any reason why Malhi and Hayashi would not be combinable. They are both directed to complementary type thin film field-effect

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transistors formed on insulating substrates and the artisan clearly would have been led to employ the supporting substrate of Malhi in Hayashi since, as the examiner contends, it would appear that the supporting substrate of Malhi is "a widely use [sic, used] supporting material for [a] thin film transistor" [answer-top of page 5].

Since appellants do not argue the merits of dependent claims 2 through 4 separate from independent claim 1, claims 2 through 4 will fall with claim 1.

Accordingly, the examiner's decision rejecting claims 1 through 4 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 CFR ' 1.136 (a).

AFFIRMED

Kenneth W. Hairston)	
Administrative Patent Judge)	
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)	
Errol A. Krass)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
)	INTERFERENCES
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