

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DANIEL VINCENT ROWLAND

Appeal No. 2001-2085
Application No. 09/104,409

ON BRIEF

Before KRASS, BARRY and BLANKENSHIP, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 13, 16 and 17. Claims 14 and 15 have been indicated by the examiner as being directed to allowable subject matter and form no part of this appeal.

The invention is directed to a method for monitoring a temperature in a rapid thermal processing (RTP) step. In particular, the silicidation reaction of a cobalt film on silicon is utilized by measuring the cobalt film prior to thermal processing and the resultant cobalt silicide sheet resistance after thermal processing to determine accurately the reaction temperature at the cobalt/silicon interface.

Independent claim 13 is reproduced as follows:

13. A method for monitoring temperature in a thermal processing system, comprising the steps of:

depositing a cobalt film on a semiconductor substrate;

measuring a resistance characteristic of the cobalt film prior to generating a cobalt silicide;

performing thermal processing on the substrate, thereby generating the cobalt silicide film;

measuring a resistance characteristic of the cobalt silicide; and

determining a temperature of the thermal processing using the resistance characteristic of the cobalt film and the cobalt silicide film, respectively.

The examiner relies on the following references:

Powell et al. (Powell)	4,764,026	Aug. 16, 1988
Yoder	5,225,366	Jul. 06, 1993
Fiory	5,624,590	Apr. 29, 1997

Wolf, "Silicon Processing for the VLSI Era, Vol. 2: Process Integration", pp. 150-152 , Lattice Press (1990).

Claims 13, 16 and 17 stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner cites Fiory, Wolf and Powell with regard to claims 13 and 16, adding Yoder to this combination with regard to claim 17.

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

OPINION

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teachings, suggestions or implications in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See Id.; In re

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Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976).

It is the examiner's position that Fiory teaches the monitoring of temperature in a thermal processing system for forming titanium silicide by depositing a titanium film on a semiconductor substrate, performing a rapid thermal processing (RTP) on the substrate, generating a titanium silicide, measuring the resistivity of the silicide, and determining the temperature of the thermal processing using the resistivity measurement, referring to column 9, lines 24-37.

Since Fiory uses titanium, rather than cobalt, as claimed, the examiner turns to Wolf for a teaching that cobalt is a viable alternative to titanium in silicide formation, referring to page 151. The examiner concludes that it would have been obvious to modify Fiory's process, using cobalt instead of titanium, because cobalt has certain advantages over titanium in silicide formation, such as lower shear forces, no competing reaction, and less susceptibility to plasma etching, again referring to page 151 of Wolf. This appears, to us, a reasonable, and obvious, modification.

However, the examiner then indicates that it is recognized that Fiory, even as modified by Wolf, also does not teach measuring a resistance characteristic of the cobalt film prior to silicide anneal and factoring in this measurement in the step of determining the temperature of the thermal processing with the resistance of the cobalt

silicide film after annealing. The examiner turns to Powell, pointing specifically to Powell's teaching of determining the temperature of wafer processing in metal silicide formation from a sheet resistance measurement and of correlating the resistance measurement to a temperature value through a resistivity-temperature plot. The examiner concludes that it would have been obvious "to modify Fiory's process with a resistance measurement before annealing in order to provide the resistivity-temperature plot and temperature value determination of Powell..., an initialization resistivity measurement at the beginning of the annealing process" [answer-pages 4-5].

We will not sustain the rejection of claims 13 and 16 under 35 U.S.C. § 103 because it is our view that the examiner's reasoning, leading to the conclusion of obviousness, is flawed.

While Powell shows a graph which indicates how the resistivity of a silicon substrate varies over temperature, we agree with appellant that Powell provides no teaching or suggestion that a film is formed over the silicon substrate and that a film resistivity measurement is taken **prior** to thermal processing. Since none of the applied references suggests taking a resistivity measurement prior to thermal processing, and, accordingly, determining a temperature of the thermal processing using the resistance characteristic of the cobalt film **and** the cobalt silicide, the claimed subject matter is not made obvious, within the meaning of 35 U.S.C. § 103, based on Fiory, Wolf and Powell.

The examiner argues that while it may be that no applied reference teaches the measurement of a resistance characteristic of the cobalt film **prior** to the generation of the cobalt silicide, it is “a well-known experimental procedure to test before, during and after a process has been completed” and it is “inherent with the combinations listed above that testing in the form of a resistivity measurement would be made before during and after silicide formation has to take place, in order to understand what happens during the process if any abnormalities occur during the intrinsic portion of the resistance-temperature curve” [answer-pages 6-7].

The examiner’s argument is not well-taken. Where the examiner relies on inherency, the examiner must provide a basis to reasonably support the determination that what the examiner alleges is inherent must **necessarily** occur. In re Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). The mere fact that a certain thing MAY result from a given set of circumstances is not sufficient to establish inherency. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

The examiner has failed to show that the measurement of a resistance characteristic prior to silicidation necessarily occurs from a combination of the applied references. Accordingly, there is no showing of inherency and no suggestion in the combination of applied references of measuring a resistance characteristic of the cobalt film prior to generating a cobalt silicide.

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The rejection of claims 13 and 16 under 35 U.S.C. § 103 is not sustained.
Further, since Yoder fails to provide for the deficiencies of the primary references noted supra, we also will not sustain the rejection of claim 17 under 35 U.S.C. § 103.

The examiner's decision rejecting claims 13, 16 and 17 under 35 U.S.C. § 103 is reversed.

REVERSED

ERROL A. KRASS)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
LANCE LEONARD BARRY)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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HOWARD B. BLANKENSHIP)	
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