

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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 AUGUSTE J.L. SOPHIE and FUMITOSHI OZAKI

Appeal No. 2005-1926
Application No. 10/188,723

ON BRIEF

Before WARREN, TIMM, and FRANKLIN, **Administrative Patent** Judges.

FRANKLIN, **Administrative Patent Judge**.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 2-8, 10-12, and 15-17.

Claims 3, 12, and 17 are representative of the subject matter on appeal, and are set forth below:

3. A method for depositing a nitrogen-doped silicon carbide(Si-C-N) material on a surface, comprising:

loading a substrate having a surface into a processing chamber;

introducing at least one chemical precursor and a carrier gas into the processing chamber, the carrier gas comprising nitrogen gas; and

applying an electromagnetic energy to the at least one chemical precursor and the carrier gas, thereby depositing on the surface of the substrate the Si-C-N material comprising silicon, carbon and nitrogen, wherein substantially all of the nitrogen contained in the deposited material originates from the nitrogen gas.

12. A process for forming a layer comprising silicon and carbon in integrated circuit fabrication, comprising:
introducing into a chamber for plasma enhanced chemical vapor deposition (PECVD) one or more chemical precursors comprising silicon and carbon along with a carrier gas including nitrogen gas entraining the chemical precursors into the chamber; and
carrying out the PECVD in the chamber such that the carrier gas is activated to generate its own excited species, thereby depositing a layer comprising silicon, carbon and an element from the carrier gas on a substrate in a chamber, wherein the nitrogen gas is an exclusive source of the element for the layer.

17. A method for depositing a nitrogen-doped silicon carbide (Si-C-N) material on a surface, comprising:
loading a substrate having a surface into a processing chamber;
introducing chemical precursors into the processing chamber, wherein the chemical precursors consist essentially of a first chemical precursor that is a source of carbon that is free of nitrogen; a second chemical precursor, that is a source of silicon that is free of nitrogen; and a third chemical precursor, wherein the third chemical precursor is a carrier gas consisting essentially of diatomic nitrogen gas; and
applying an electromagnetic energy to the first chemical precursor and a carrier gas, thereby depositing on the surface of the substrate the Si-C-N material comprising silicon, carbon and nitrogen, wherein the nitrogen contained in the deposited Si-C-N material consists essentially of nitrogen that originates from the nitrogen gas.

The examiner relies upon the following reference as evidence of unpatentability:

Todd 2002/0016084 A1 Feb. 7, 2002

Claims 2-8, 10-12, and 15-17 stand rejected under 35 U.S.C. § 103(a) as being obvious over Todd.

Appellants group claims 2-8, 10, 11, 15 and 16 together, and group claims 12 and 17 separately. We therefore consider claims 3, 12, and 17 in this appeal. See 37 CFR § 41.37(c)(1)(vii) (September 2004); formerly 37 CFR § 1.192(c)(7) (2003). Also see Ex parte Schier, 21 USPQ2d 1016, 1018 (Bd. Pat. App. & Int. 1991).

We have carefully reviewed appellants' brief, the answer, and the evidence of record. This review has led us to the following determinations.

OPINION

I. The 35 U.S.C. § 103(a) rejection of claims 2-8, 10-12, and 15-17 as being obvious over Todd

The examiner's position for this rejection is set forth on pages 3-5 of the answer.

Beginning on page 4 of the brief, appellants argue that the instant claims are directed to a method in which substantially all of the nitrogen contained in the deposited material (claims 3, 15, and 16), substantially all of the nitrogen in the excited species (claim 10), exclusively all of the nitrogen of the layer (claim 12), or precisely all of the third chemical precursor (claim 17), are derived from nitrogen gas. Appellants provide supportive arguments on pages 4-14 of the brief, which we have

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carefully considered, but do not repeat them here, but simply refer to them as presented in the brief.

Upon our review of the brief and the examiner's answer, we observe that the critical issue before us is whether Todd suggests a method for depositing a nitrogen-doped carbide material wherein "substantially all of the nitrogen contained in the deposited material originates from the nitrogen gas" (claim 3) or wherein "nitrogen gas is an exclusive source of the element" (claim 12), or wherein the "nitrogen contained in the deposited Si-C-N material consists essentially of nitrogen that originates from the nitrogen gas" (claim 17). The term "nitrogen gas" refers to diatomic nitrogen.

The examiner states that Todd teaches that N₂ is useful as a source of nitrogen, and refers to paragraph [0044] of Todd. The examiner states that Todd teaches that the composition of the mixture of precursors used can vary over a broad range and that routine experimentation can be used to arrive at a desired mixture of precursors for achieving a desired stoichiometry of the deposited material. The examiner states that there is desirability to arrive at appellants' claimed invention based upon a reasonable expectation of success when employing N₂ as the sole nitrogen source to deposit a nitrogen-doped silicon nitride material. Answer, page 7. The examiner states that one of ordinary skill in the art would have had a reasonable expectation of success when employing nitrogen gas as the only source of nitrogen. The examiner states that Todd teaches that N₂ will act as a source of nitrogen, and that it is not necessary that is a preferred embodiment. Answer, page 8.

We note that "the consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in the light of the prior art." In re Dow Chem. Co., 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988) (citing Burlington Indus. v. Quigg, 822 F.2d 1581, 583, 3 USPQ2d 1436, 1438 (Fed. Cir. 1987); In re Hedges, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1987)); Orthopedic Equip. Co. v. United States, 702 F.2d 1005, 1013, 217 USPQ 193, 200 Fed. Cir. 1983); In re Rinehart, 531 F.2d 1048, 1053-54, 189 USPQ 143, 148 (CCPA 1976). It is thus the position of the court that a proper analysis under Section 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure. Dow Chem., supra.

In the instant case, although Todd discloses a preferred embodiment of supplying the silicon and nitrogen atoms by a Si-N containing chemical precursor (see paragraph [0026] of Todd), Todd is not so limited. The chemical precursor need not have a Si-N bond. Paragraphs [0026] and [0029] of Todd.

Todd teaches that a gas can be provided that comprises a chemical precursor and a supplemental source. Paragraph [0043]

of Todd. This gas can be selected to have an elemental composition that approximates the elemental composition of the deposited silicon nitride material. Paragraph [0043] of Todd. The chemical precursor is a chemical that contains the elements of silicon and/or [emphasis added] nitrogen, and therefore can contain silicon. Paragraph [0026] of Todd. The supplemental source can be N₂. Paragraph [0044] of Todd.

In view of the above teachings of Todd, we agree with the examiner that Todd would have suggested appellants' claimed method. We note that one of ordinary skill in the art would have evaluated Todd's disclosure as a whole, rather than solely the working examples or preferred embodiments, because a prior art disclosure is not limited to its working examples or to its preferred embodiments. Merck & Co. Inc. v. Biocraft Labs. Inc., 874 F.2d 804, 807, 10 USPQ2d 1843, 1846 (Fed. Cir. 1989); In re Fracalossi, 681 F.2d 792, 794 n.1, 215 USPQ 569, 570 n.1 (CCPA 1982); In re Lamberti, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976); In re Boe, 355 F.2d 961, 965, 148 USPQ 507, 510 (CCPA 1966).

Furthermore, Todd explicitly teaches that the composition of the silicon nitride material can vary over a broad range and that "routine experimentation" may be used to select a suitable mixture and deposition method which together result in the deposition of a film having the desired chemical composition. Paragraph [0038] of Todd. Hence, as stated by the examiner on pages 9-10 of the answer, the motivation has been provided by Todd to arrive at the instant mixture of source gases, and that the common goal is the formation of a desired nitrogen-doped silicon carbide material. We also add that in view of the

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above-stated teachings of Todd, a reasonable expectation of success is founded in the prior art. Hence, the examiner has set forth a prima facie case of obviousness. Dow Chem., 837 F.2d at 473, 5 USPQ2d at 1531 (citing Burlington Indus. v. Quigg, 822 F.2d 1581, 583, 3 USPQ2d 1436, 1438 (Fed. Cir. 1987)).

In view of the above, we therefore affirm the 35 U.S.C. § 103(a) rejection of claims 2-8, 10-12, and 15-17 as being obvious over Todd.

II. Conclusion

The 35 U.S.C. § 103(a) rejection of claims 2-8, 10-12, and 15-17 as being obvious over Todd is 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) (effective Sept. 13, 2003; 69 Fed. Reg. 49960 (Aug. 12, 2004); 1286 Off. Gaz. Pat., Office 21 (Sept. 7, 2004)).

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AFFIRMED

CHARLES F. WARREN)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
CATHERINE TIMM)	APPEALS AND
Administrative Patent Judge)	INTERFERENCES
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BEVERLY A. FRANKLIN)	
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BAF:hh

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