

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 11

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte

MICHAEL D. ARMACOST, DAVID M. DOBUZINSKY,
JOHN C. MALINOWSKI, HUNG Y. NG,
RICHARD S. WISE, and CHIENFAN YU

Appeal No. 2001-1133
Application No. 09/014,806

ON BRIEF

Before WALTZ, LIEBERMAN and KRATZ, Administrative Patent Judges.

LIEBERMAN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner refusing to allow claims 1 through 3, 5 through 10, 12, 13, and 15 through 18, which are all the claims pending in this application.

THE INVENTION

The invention is directed to an anisotropic etching process wherein the etchant gas comprises fluorohydrocarbon, diatomic oxygen and a carbon source. Each of the components is present in a specific volume. Additional limitations are described in the following illustrative claim.

THE CLAIMS

Claim 1 is illustrative of appellants' invention and is reproduced below.

1. An anisotropic etching process for a nitride layer on a substrate, the process comprising etching with an etchant gas comprised of a hydrogen-rich fluorohydrocarbon, diatomic oxygen, and a carbon source, wherein the fluorohydrocarbon is present in the gas at 7% - 35% by volume, the diatomic oxygen is present in the gas at 1% - 35% by volume, and the carbon source is present in the gas at 30% - 92% by volume.

THE REFERENCES OF RECORD

As evidence of obviousness, the examiner relies upon the following reference:

Kadomura	4,654,114	Mar. 31, 1987
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THE REJECTIONS

Claims 1 through 3, 5 through 10, 12, 13, and 15 through 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kadomura.

Claims 1 through 3, 5 through 10, 12, 13, and 15 through 18 stand rejected

under 35 U.S.C. § 112, first paragraph, for failing to enable any person skilled in the art to make and use the invention.

OPINION

We have carefully considered all of the arguments advanced by the appellants and the examiner and agree with the appellants that the rejections of the claims under §§ 112 and 103(a) are not well founded. Accordingly, we reverse these rejections.

The Rejection under § 112

We turn first to the examiner's rejection under the first paragraph of 35 U.S.C. § 112, first paragraph, on the grounds of lack of enablement. When rejecting a claim under the enablement requirement of section 112, the PTO bears the initial burden of setting forth a reasonable explanation as to why it believes the scope of protection provided by the claimed subject matter is not adequately enabled by the description of the invention provided in the specification of the application. This includes providing sufficient reasons for doubting any assertions in the specification as to the scope of enablement. If this burden is met, the burden then shifts to the appellants to provide suitable proofs that the specification is enabling. *In re Wright*, 999 F.2d 1557, 1561-62, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993); *In re Marzocchi*, 439 F.2d 220, 223-24, 169 USPQ 367, 369-70 (CCPA 1971).

The examiner's position is that the claimed subject matter is not enabled in the specification, because the original specification provided that the only concentrations given

relate specifically to CH_3F . See Answer, page 4. Furthermore, the only examples found in the specification are likewise directed to CH_3F . *Id.* When the disclosure is coupled with appellants statement that as the, “mechanism for nitride: oxide selectivity in their chemistry is not well understood,” it follows that the invention as claimed is not enabled. *Id.* We disagree.

As we stated above, the burden of proof of finding that the invention is not enabled rests with the Office. The specification provides specific volume ratios for CH_3F , diatomic oxygen and carbon dioxide. See specification, pages 4 and 5. In addition, the specification as originally filed, provides for an etchant gas comprising a hydrogen rich fluorohydrocarbon, an oxidant and a carbon source. See original claim 1. Furthermore, original claim 4 specifically provides for a fluorohydrocarbon gas present at approximately 7% - 35% by volume. Based upon these findings, we conclude that appellants specifically intended that the volume of fluorohydrocarbon gas apply to all fluorohydrocarbons and not just the CH_3F as argued by the examiner. Accordingly, we cannot agree with the examiner’s conclusion that the ratios apply only to the sole aforesaid fluorohydrocarbon, CH_3F . Furthermore, the argument presented in the Answer, pages 4 and 5, based upon the statement that since the, “mechanism for nitride: oxide selectivity in their chemistry is not well understood,” it would not apply to other fluorohydrocarbons, is speculative in nature and insufficient to support a rejection on the grounds of lack of enablement. Accordingly, we cannot sustain the rejection under § 112.

The Rejection under § 103

"[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." See In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). The examiner relies upon a single reference to reject the claimed subject matter and establish a prima facie case of obviousness. It is the examiner's position that, although, "Kadomura is silent as to using diatomic oxygen," nonetheless, "it would have been obvious to those of ordinary skill in the art to include O₂ in the etchant gas mixture because it is well known as oxidizing gas and because combining materials or additives for their art recognized function and said additives do perform their art recognized function is obvious." See Answer, pages 6 and 7. We disagree.

Kadomura is directed to a dry etching method wherein silicon nitride existing on a substrate of silicon dioxide can be etched at a sufficiently high selective ratio between the nitride and the oxide without providing deposition of polymeric film. See column 2, lines 47-53. Furthermore, we agree with the examiner's finding that, "Kadomura is silent as to using diatomic oxygen." See Answer, page 6. The entire issue of a teaching or suggestion for the utilization of oxygen is a result of the background disclosure present in the Kadomura patent. We find that Kadomura states in the background of the invention that, the etch rate of Si₃N₄ becomes higher when the etching gas

contains a small amount of O_2 or CO_2 . However, when using such a mixed gas for etching of Si_3N_4 on top of SiO_2 , the etch rate of the underlying SiO_2 also increases because of the suppression of the formation of the polymers which are effective to prevent etching of SiO_2 . Consequently, the selective ratio of etching between Si_3N_4 and SiO_2 becomes very much lower than the desired or tolerable level. This deficiency is not fundamentally removed even when CO_2 is added to the etching gas instead of O_2 .

See column 2, lines 33-44. See also column 1, lines 45-61, and column 3, lines 34-42. We determine that the entire disclosure present in Kadomura supports the proposition that the utilization of oxygen lowers the selectivity ratio of etching between silicon nitride on a silicon dioxide substrate. Accordingly, we conclude that Kadomura expressly teaches away from the utilization of oxygen in etching a silicon nitride on a silicon dioxide substrate. It follows that the examiner's conclusion that oxygen be present in an etching process because it is a well known oxidizing gas is untenable. Accordingly, the rejection of the examiner cannot be sustained.

DECISION

The rejection of claims 1 through 3, 5 through 10, 12, 13, and 15 through 18 under 35 U.S.C. § 103(a) as being unpatentable over Kadomura is reversed.

The rejection of claims 1 through 3, 5 through 10, 12, 13, and 15 through 18 under 35 U.S.C. § 112, first paragraph, for failing to enable any person skilled in the art to make and use the invention is reversed.

The decision of the examiner is reversed.

REVERSED

THOMAS A. WALTZ
Administrative Patent Judge

PAUL LIEBERMAN
Administrative Patent Judge

PETER F. KRATZ
Administrative Patent Judge

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