

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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 ROLAND BRUNNER, HELMUT SCHWENK,
and JOHANN ZACH

Appeal No. 2006-1078
Application No. 09/425,694

ON BRIEF

Before WALTZ, FRANKLIN, and GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the Final Rejection mailed September 17, 2005. Claims 1-9 and 11-15 are pending. All of the pending claims have been finally rejected and are appealed.

Claims 1 and 12 are illustrative of the subject matter on appeal and are reproduced below:

1. A process for the wet chemical treatment of semiconductor wafers with treatment liquids in baths, consisting of the steps of firstly treating the semiconductor wafers in a bath with an aqueous HF solution containing HF and optionally HCl and optionally a surfactant; then treating the semiconductor wafers in a bath with an aqueous O₃ solution containing O₃ and optionally HF; and then treating the semiconductor wafers in a bath with an aqueous HCl solution containing HCl and optionally O₃;

whereby these treatment steps form a treatment sequence B₂, which avoids rinsing with water or another treatment liquid and the addition of fresh water or other liquids to the treatment baths.

12. A process for the wet chemical treatment of semiconductor wafers with treatment liquids in baths, comprising the steps of firstly treating the semiconductor wafers in a bath with an aqueous HF solution containing HF and optionally HCl and optionally a surfactant; then treating the semiconductor wafers in a bath with an aqueous O₃ solution containing O₃ and optionally HF; and then treating the semiconductor wafers in a bath with an aqueous HCl solution containing HCl and optionally O₃; whereby these treatment steps form a treatment sequence B₂; and circulating the treatment liquids of said bath by taking a part from each of said baths, filtering and returning the part to the corresponding treatment bath.

References Relied on by the Examiner

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

Berman	5,014,737	May 14, 1991
Davison	5,593,538	Jan. 14, 1997
Verhaverbeke et al. (Verhaverbeke)	6,132,522	Oct. 17, 2000
Pirooz et al. (Pirooz)	EP 0 701 275	Mar. 13, 1996

Grounds of Rejection

1. Claims 1-9 and 11 are rejected under 35 U.S.C. § 103(a) as unpatentable over Pirooz in view of Verhaverbeke.

2. Claims 12-15 are rejected under 35 U.S.C. § 103(a) as unpatentable over Pirooz in view of Verhaverbeke and further in view of Berman or Davison.

We reverse as to both grounds of rejection.

Background

The invention relates to processes for the wet chemical treatment of semiconductor wafers using a particular sequence of treatment liquids. The inventors have found that it is unnecessary to use a water rinsing step in the sequence, thereby reducing processing costs associated with rinsing treatments. The processes are said to be effective in removing metallic impurities and particles from semiconductor wafers.

Discussion

Claims 1-9 and 11 are rejected under 35 U.S.C. § 103(a) as unpatentable over Pirooz in view of Verhaverbeke. Independent claims 1 and 11 are directed to processes which require the steps of : (1) treating semiconductors in a bath with an aqueous HF solution containing HF, (2) treating semiconductors in a bath with an aqueous O₃ solution containing O₃ and (3) treating semiconductors in a bath with an aqueous HCl solution containing HCl.

The Examiner notes that Pirooz teaches a process for heat-treating a silicon wafer which includes the steps of (1) contacting the surface of the wafer with an aqueous solution containing HF and optionally HCl to remove metals from the wafer surface; (2) contacting the wafer with ozonated water to grow a hydrophilic oxide layer. Pirooz does not disclose a step of treating semiconductors in a bath with an aqueous HCl solution containing HCl. Moreover, Pirooz discloses the wafers should be rinsed with DI water after each of the steps. (Examiner's Answer, p. 3).

The examiner relies on Verhaverbeke for a teaching of a sequential chemical process wherein electronic component precursors are moved from one reaction

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chamber to another, with each reaction chamber containing a different reactive chemical process fluid (col 5, ll. 35-60 and col. 5, ll. 17-50). The examiner notes that electronic component precursors are exposed to at least two consecutive reactive chemical process fluids without an intermediate step of rinsing with deionized water. (col. 4, ll. 14-23 and col. 5, ll. 39-57). The examiner further directs us to Verhaverbeke's disclosure of a rinse fluid which may be DI water or a very dilute aqueous solution of a hydrochloric acid. (col. 5, ll. 1-17).

According to the examiner:

Two modifications to Pirooz, which would have been obvious to a person of ordinary skill in the art at the time of invention in view of Verhaverbeke, are necessary to arrive at appellant's invention. The first modification requires the elimination of the rinsing with deionized water in the second step. The second modification requires modifying the final step of rinsing with DI water to include HCl.

More specifically, the examiner maintains that it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pirooz et al with Verhaverbeke's method of sequential chemical processing without rinsing to increase output and savings (col. 4, ll 15-25). The examiner further asserts that it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pirooz' final rinsing step with Verhaverbeke's aqueous solution of HCl to prevent metal deposition (:522 col. 5, ll. 5-15).

In determining obviousness, the relevant inquiry is "[would] an artisan of ordinary skill in the art at the time of the invention, confronted by the same problems as the

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inventor and with no knowledge of the claimed invention, [] have selected the various elements from the prior art and combined them in the manner claimed." See *Princeton Biochemicals, Inc. v. Beckman Coulter, Inc.*, 411 F.3d 1332, 1337, 75 USPQ2d 1051, 1054 (Fed. Cir. 2005). To establish a *prima facie* case of obviousness, the examiner must identify some objective teaching in the prior art or show that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. The examiner may not resort to speculation, unfounded assumption or hindsight reconstruction to supply deficiencies in the factual basis. See *In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967).

Appellants argue that the examiner's rejection is improperly based on hindsight reasoning. We agree. In particular, we find that the examiner' has failed to identify any incentive *in the prior art* to substitute Pirooz's DI rinse with Verhaverbeke's aqueous solution of HCl.

Appellants maintain that one of ordinary skill in the art would not have been motivated to substitute Pirooz's deionized water rinse with an aqueous HCl rinse given Pirooz's explicit statement that "if the ozonated bath contains hydrochloric or nitric acid, . . . the treated wafers should be rinsed . . . in deionized water." (Appeal Brief, p. 6).

In response, the examiner argue:

the hydrochloric acid in the DI rinse, taught by Verhaverbeke, is explicitly taught to contain HCl in a minute concentration and Verhaverbeke specifically teaches the primary goal of the rinsing fluid is to remove chemicals or reaction products from the surface of electronic components,

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and not to perform some “reactive process”(column 5, lines 1-17). The rinsing fluid still maintains its function of removing chemical from the electronic components because the HCl is only present in a minute concentration and specifically present in an amount, which is non-reactive.

Absent from the examiner’s explanation is some factual basis to establish the desirability of replacing Pirooz’s deionized water rinse with another rinsing solution. Moreover, given Pirooz’s teaching that a deionized water rinse is necessary unless the ozonated bath is “acid-free” (see col. 3, ll. 35-41), the examiner was obligated to provide some evidentiary basis for his conclusion that the one of ordinary skill in the art would have been motivated to use a rinsing solution containing even a minimal amount of HCl. *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1532 (Fed. Cir. 1988) (“Evidence that supports, rather than negates, patentability must be fairly considered.”). “The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.” *In re Fritch*, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783-74 (Fed. Cir. 1992). See *In re Lee*, 277 F.3d 1338, 1343-44, 61 F.2d 1430, 1434 (Fed. Cir. 2002) (“[The] factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority.”)¹

¹ We note that the examiner’s statement that “appellant's also teach an embodiment where the final treatment could be aqueous HCl or water (page 2, lines 1-3 of the specification), which suggests that appellant's final aqueous HCl step also functions more as a rinse step” suggests that improper hindsight reasoning was employed. See *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992) (quoting *W.L. Gore v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed.Cir.1983)(“In determining whether a person of ordinary skill would have been led to this combination of references, simply to [use] that which the inventor taught

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The rejection is reversed.

Claims 12-15 are rejected under 35 U.S.C. § 103(a) as unpatentable over Pirooz in view of Verhaverbeke and further in view of Berman or Davison.

According to the examiner, the combination of Pirooz et al and Verhaverbeke et al teach all of the limitations of claims 12-15, except the circulating of treatment liquids of the baths by taking a part from each of the baths, filtering and returning the part to the corresponding treatment bath. The examiner's reliance on Berman and Davison is limited to a teaching of reducing contamination in treatment baths using recirculation.

Having concluded that the examiner has not shown the requisite motivation to combine the teachings of Pirooz et al and Verhaverbeke et al, we find that the examiner has failed to establish a prima facie case of obviousness as to claims 12-15 for the reasons set forth above with respects to claims 1-9 and 11.²

The rejection is reversed.

against its teacher'."))

² We note that claims 1-9 and 11 use the introductory language "consisting of" while claims 12-15 use the language "comprising" which opens the claims to additional steps.

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REVERSED

THOMAS A. WALTZ)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
BEVERLY A. FRANKLIN)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
)	
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LINDA M. GAUDETTE)	
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