

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

PROMOS TECHNOLOGIES, INC.,
Patent Owner.

Case IPR2017-00035
Patent 6,020,259

Before KEVIN F. TURNER, JO-ANNE M. KOKOSKI, and
JEFFREY W. ABRAHAM, *Administrative Patent Judges*.

ABRAHAM, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Samsung Electronics Co., Ltd. (“Petitioner”) filed a Petition seeking *inter partes* review of claims 1–10 of U.S. Patent No. 6,020,259 (Ex. 1001, “the ’259 patent”). Paper 1 (“Pet.”). ProMOS Technologies, Inc. (“Patent Owner”) filed a Patent Owner Preliminary Response to the Petition. Paper 6 (“Prelim. Resp.”). After considering the Petition and Preliminary Response, we determine that Petitioner has not established a reasonable likelihood of prevailing with respect to any of the challenged claims of the ’259 patent. *See* 35 U.S.C. § 314(a). Accordingly, we deny the Petition, and do not institute *inter partes* review.

II. BACKGROUND

A. *Related Proceedings*

The parties identify *ProMOS Technologies, Inc. v. Samsung Electronics Co., Ltd.*, Civil Action No. 1:15-cv-00898-SLR-SRF (D. Del.), involving the ’259 patent. Pet. 1; Paper 5, 1. The parties also identify IPR2017-00033, another petition seeking review of the ’259 patent. Pet. 1; Paper 5, 1.

B. *The ’259 Patent*

The ’259 patent, titled “Method of Forming a Tungsten-Plug Contact for a Semiconductor Device,” issued on February 1, 2000. Ex. 1001, [54], [45]. The ’259 patent discloses a method of forming “a W-plug by using selective TiSi₂ [chemical vapor deposition (CVD)] process, TiN CVD process and chemical mechanical polishing (CMP).” *Id.* at 2:41–43. The method of the ’259 patent includes (1) depositing an isolation layer, such as BPSG or silicon oxide, on a substrate, (2) generating a contact hole in the

isolation layer by an etching process, (3) selectively depositing a TiSi_2 layer in the contact hole on the substrate using CVD, (4) forming a TiN layer on the isolation layer, the sidewall of the contact hole, and the TiSi_2 layer, (5) forming a tungsten layer on the TiN layer and in the contact hole, and (6) polishing the tungsten layer to the surface of the isolation layer for planarization. *Id.* at 2:62–3:37.

The '259 patent teaches that the TiSi_2 layer can be selectively deposited at the contact region using TiCl_4 as the reaction material and by controlling the temperature and pressure of the reaction. *Id.* at 3:13–18 (stating that the preferred temperature of CVD is about 600–900° C, and the preferred pressure is 5 to 100 torr). The '259 patent also teaches that “[t]he present invention provides a thinner TiN layer process to reduce the time for CMP polish. Therefore, the cost of the process is degraded and the throughput is increased. Further, the erosion problem . . . generated by long polish time is eliminated by the present invention.” *Id.* at 3:38–42; *see also id.* at 1:48–55 (noting that the conventional CMP process “needs [a] long polish time to remove the thick TiN layer” which “may cause the erosion effect” and “raises the cost” of CMP).

C. Challenged Claims

Petitioner challenges claims 1–10 of the '259 patent. Independent claim 1 is illustrative, and is reproduced below:

1. A method of forming an electrical contact on a semiconductor wafer, said method comprising:
 - forming an isolation layer on said wafer;
 - forming a contact hole in said isolation layer, said contact hole exposing a portion of said wafer;

selectively forming a TiSi₂ layer in said contact hole on said exposed wafer by using chemical vapor deposition and by controlling a deposition temperature, the reaction material being TiCl₄, wherein said reaction material (TiCl₄) reacts with said exposed wafer thereby forming said TiSi₂ wherein said TiSi₂ layer is selectively formed at said deposition temperature in the range of about 600° C. to 700° C.;

forming a TiN layer on said isolation layer, on the surface of said contact hole and on the TiSi₂ layer by using chemical vapor deposition in nitrogen ambient environment, the reaction material being TiCl₄;

forming a tungsten layer on said TiN layer and in said contact hole; and

planarizing said tungsten layer and said TiN layer to the surface of said isolation layer by using chemical mechanical polishing.

Id. at 3:56–4:13. Independent claim 4 is substantially similar to claim 1, except that it does not require that the “TiSi₂ layer is selectively formed at said deposition temperature in the range of about 600° C. to 700° C.,” and further requires that the “TiN layer is formed at a temperature in the range of about 600° C. to 900° C.” *Id.* at 4:23–45.

D. References

Petitioner relies on the following references:

Hillman et al., *Integrated CVD titanium and titanium nitride processes for sub-0.5-μm metallization*, Solid State Technology 147–152, July 1995 (“Hillman Paper,” Ex. 1009).

Hillman et al., US Patent No. 5,975,912, issued Nov. 2, 1999 (“Hillman ’912,” Ex. 1010).

Arena et al., US Patent No. 5,972,790, issued Oct. 26, 1999 (“Arena,” Ex. 1011).

Mathews et al., US Patent No. 5,580,821, issued Dec. 3, 1996 (“Mathews,” Ex. 1006).

Suzuki et al., JP H05-67585, published March 19, 1993 (“Suzuki,” Ex. 1004).

Petitioner also relies on Applicant’s Admitted Prior Art (“AAPA”) and the Declaration of Gary Rubloff, PhD. (Ex. 1002).

E. The Asserted Grounds

Petitioner asserts the following grounds of unpatentability:

References	Statutory Basis	Claims Challenged
Hillman Paper, Hillman ’912, Arena, and AAPA	§103	1, 3, 4, 7, and 9
Hillman Paper, Hillman ’912, Arena, AAPA, and Mathews	§103	2 and 8
Hillman Paper, Hillman ’912, Arena, AAPA, and Suzuki	§103	5, 6, and 10

III. ANALYSIS

A. Claim Construction

Petitioner offers a proposed construction for “forming a TiN layer . . . by using chemical vapor deposition in nitrogen ambient environment, the reaction material being TiCl₄.” Pet. 24–26. Patent Owner argues that the Board does not need to construe this limitation in order to resolve the question of patentability. Prelim. Resp. 15–16.

We agree with Patent Owner that no express claim construction is necessary for purposes of this decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be

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