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Paper 13
Date: May 11, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLIED MATERIALS, INC.,
Petitioner,

v.

DEMARAY LLC,
Patent Owner.

IPR2021-00104
Patent 7,381,657 B2

Before CHRISTOPHER L. CRUMBLEY, KRISTINA M. KALAN, and KIMBERLY McGRAW, *Administrative Patent Judges*.

McGRAW, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Applied Materials, Inc. ("Petitioner") filed a Petition (Paper 1, "Pet.") requesting an *inter partes* review of claims 1–21 of U.S. Patent No. 7,381,657 B2 (Ex. 1001, "the '657 patent"). Demaray LLC ("Patent Owner") filed a Preliminary Response to the Petition (Paper 7, "Prelim. Resp."). Pursuant to our authorization (Paper 9), Petitioner filed a Reply (Paper 10, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 12, "PO Sur-reply").

To institute an *inter partes* review, we must determine that the information presented in the Petition shows "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). For the reasons discussed below, after considering the parties' submissions and the evidence of record, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one claim of the '657 patent. Patent Owner has not provided us with a persuasive reason to exercise our discretion to deny institution. Thus, we institute an *inter partes* review.

A. Related Proceedings

The parties identify *Demaray LLC v. Samsung Electronics Co., Ltd.* et al., No. 6-20-cv-00636 (W.D. Tex.); *Demaray LLC v. Intel Corp.* No. 6-20-cv-00634 (W.D. Tex.) (collectively, the "Texas Litigations"); and *Applied Materials, Inc. v. Demaray LLC*, No. 5-20-cv-05676 (N.D. Cal.) as related matters. Pet. 1; Paper 5, 2. Each of these proceedings involves the '657 patent. *Id.*

The parties further identify IPR2021-00106 as being filed by Petitioner against the '657 patent. Pet. 2; Paper 5, 3. Patent Owner also

identifies IPR2021-00103 and IPR2021-00105, which challenge U.S. Patent No. 7,544,276 B2, as related matters. Paper 5, 3.

B. Real Parties-In-Interest

Petitioner identifies Intel Corporation, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung Semiconductor, Inc., Samsung Austin Semiconductor, LLC, and itself as real parties-in-interest. Pet. 1. Patent Owner identifies itself as a real party-in-interest. Paper 5, 2.

C. The '657 Patent

The '657 patent, titled "Biased Pulse DC Reactive Sputtering of Oxide Films," "relates to deposition of oxide and oxynitride films and, in particular, to deposition of oxide and oxynitride films by pulsed DC reactive sputtering." Ex. 1001, code (54), 1:11–13. The '657 patent discloses that RF sputtering has been typically used to deposit oxide dielectric films but arcing can occur between sputtering target tiles used to make such films, which causes contamination in the deposited films. *Id.* at 2:25–30. The '657 patent further states that reactors for RF sputtering, particularly their power systems, are complicated. *Id.* at 2:30–38. The '657 patent discloses that reactive dc magnetron sputtering of nonconductive oxides is done rarely because insulating surfaces accumulate charge during deposition that results in arcing, damage to the sputtering power supply, and the production of particles that degrade the properties of deposited oxide films. *Id.* at 4:48–57.

Figure 1A of the '657 patent is reproduced below.

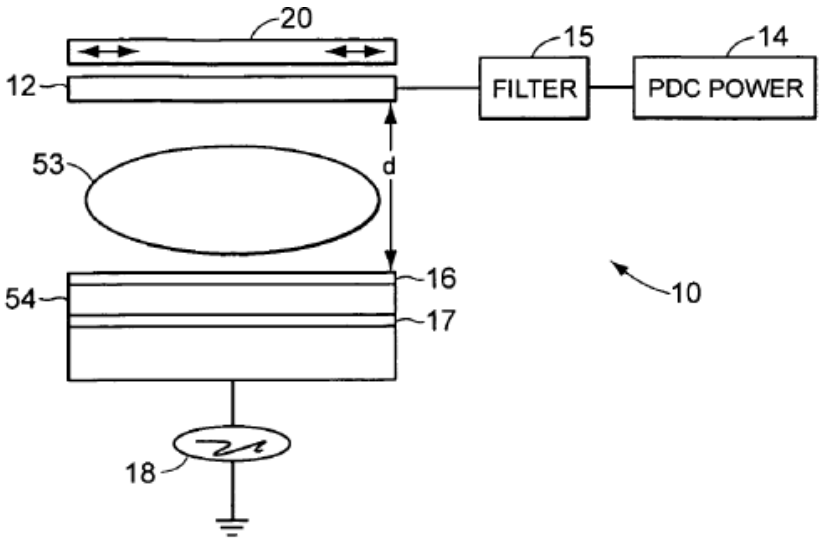

FIG. 1A

Figure 1A depicts a pulsed DC sputtering reactor

The '657 patent describes reactor apparatus 10 for sputtering material from target 12. *Id.* at 5:13–15. Magnet 20 is used to scan across the top of the target 12, which reduces local erosion of target 12 during sputtering. *Id.* at 5:35, 8:57–66. Substrate 16 is opposite and parallel to target 12. *Id.* at 5:29–30. Substrate 16 is capacitively coupled to electrode 17 via insulator 54. *Id.* at 5:32–36. Electrode 17 can be coupled to RF power supply 18. *Id.* at 5:34–35. The '657 patent explains that RF power supply 18 is used to avoid columnar structures in a deposited film, which can be detrimental for optical wave guide applications. *Id.* at 5:66–6:6. The '657 patent discloses that target 12 functions as a cathode when power is applied to the target 12, which creates plasma 53. *Id.* at 5:30–32.

Target 12 is electrically coupled through filter 15 to pulsed DC power supply 14. *Id.* at 5:25–26. The '657 patent discloses that the polarity of the power supplied to target 12 by pulsed DC power supply 14 oscillates between negative and positive potentials. *Id.* at 5:36–39. According to the

'657 patent, the insulating layer on the surface of target 12 discharges during the positive period, which prevents arcing. *Id.* at 5:39–41. The '657 patent discloses that the pulsing frequency must exceed a critical frequency, which depends on a target material, cathode current, and reverse time. *Id.* at 5:41–43.

Reactor apparatus 10 further includes filter 15, which prevents the RF power supply from coupling to into pulsed DC power supply 14. *Id.* at 5:56–57. According to the '657 patent, filter 15 can be a rejection filter, such as a 2 MHz band rejection filter when a 2 MHz power supply is used for RF power supply 18. *Id.* at 5:57–61. The '657 patent discloses that the bandwidth of filter 15 can be approximately 100 kHz. *Id.* at 5:61–63.

D. Illustrative Claim

Of the challenged claims, claims 1 and 2 are independent. Claim 2 is representative and is reproduced below with bracketed material and formatting added.

> 2. [a] A method of depositing an insulating film on a substrate, comprising:
>
> [b] providing a process gas between a target and a substrate;
>
> [c] [*c1*] providing pulsed DC power to the target [*c2*] through a narrow band rejection filter [*c1*] such that the voltage on the target alternates between positive and negative voltages;
>
> [d] providing an RF bias that corresponds to the narrow band rejection filter to the substrate; and
>
> [e] providing a magnetic field to the target;

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