

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FUJITSU SEMICONDUCTOR LIMITED, FUJITSU SEMICONDUCTOR AMERICA, INC., ADVANCED MICRO DEVICES, INC., RENESAS ELECTRONICS CORPORATION, RENESAS ELECTRONICS AMERICA, INC., GLOBALFOUNDRIES U.S., INC., GLOBALFOUNDRIES DRESDEN MODULE ONE LLC & CO. KG, GLOBALFOUNDRIES DRESDEN MODULE TWO LLC & CO. KG, TOSHIBA AMERICA ELECTRONIC COMPONENTS, INC., TOSHIBA AMERICA INC., TOSHIBA AMERICA INFORMATION SYSTEMS, INC., TOSHIBA CORPORATION, and THE GILLETTE COMPANY,
Petitioner,

v.

ZOND, LLC,
Patent Owner.

Case IPR2014-00800¹
Patent 7,811,421 B2

Before KEVIN F. TURNER, DEBRA K. STEPHENS, JONI Y. CHANG, SUSAN L. C. MITCHELL, and JENNIFER MEYER CHAGNON,
Administrative Patent Judges.

CHAGNON, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
Inter Partes Review

¹ Cases IPR2014-00844, IPR2014-00991, and IPR2014-01037 have been joined with the instant proceeding.

IPR2014-00800
Patent 7,811,421 B2

35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, we determine that Petitioner has shown by a preponderance of the evidence that claims 1, 2, 8, 10–13, 15–17, 22–25, 27–30, 33, 34, 38, 39, 42, 43, and 46–48 of U.S. Patent No. 7,811,421 B2 (Ex. 1001, “the ’421 patent”) are unpatentable.

A. Procedural History

Taiwan Semiconductor Manufacturing Company, Ltd. and TSMC North America Corp. (collectively, “TSMC”) filed a Petition (Paper 1, “Pet.”) seeking *inter partes* review of claims 1, 2, 8, 10–13, 15–17, 22–25, 27–30, 33, 34, 38, 39, 42, 43, and 46–38 (“the challenged claims”) of the ’421 patent. TSMC included a Declaration of Uwe Kortshagen, Ph.D. (Ex. 1002) to support its positions. Zond (“Patent Owner”) filed a Preliminary Response (Paper 7, “Prelim. Resp.”). Pursuant to 35 U.S.C. § 314(a), on October 6, 2014, we instituted an *inter partes* review of the challenged claims to determine if claims 1, 2, 8, 10–13, 16, 17, 22–25, 28–30, 33, 34, 39, 42, 43, and 46–48 are unpatentable under 35 U.S.C. § 102 as anticipated by Wang,² and if claims 15, 27, and 38 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Wang and Mozgrin.³ Paper 9 (“Inst. Dec.”).

² U.S. Patent No. 6,413,382 B1, issued July 2, 2002 (Ex. 1004).

³ D.V. Mozgrin et al., *High-Current Low-Pressure Quasi-Stationary*

Subsequent to institution, we granted revised Motions for Joinder filed by other Petitioners listed in the Caption above, joining Cases IPR2014-00844, IPR2014-00991, and IPR2014-01037 with the instant trial (Papers 12, 13), and also granted a Joint Motion to Terminate with respect to TSMC (Paper 32).⁴ Patent Owner filed a Patent Owner Response (Paper 27, “PO Resp.”), along with a Declaration of Larry D. Hartsough, Ph.D. (Ex. 2015) to support its positions. Petitioner filed a Reply (Paper 45, “Reply”) to the Patent Owner Response, along with a Declaration of Lawrence J. Overzet, Ph.D. (Ex. 1027). An oral hearing⁵ was held on June 8, 2015. A transcript of the hearing is included in the record. Paper 54 (“Tr.”).

B. Related Proceedings

The parties indicate that the ’421 patent was asserted against Petitioner, as well as other defendants, in seven district court lawsuits pending in the District of Massachusetts. Pet. 1; Paper 5.

C. The ’421 Patent

The ’421 patent relates to a method and apparatus for high-deposition sputtering. Ex. 1001, Abstract. At the time of the invention, sputtering was

Discharge in a Magnetic Field: Experimental Research, 21 PLASMA PHYSICS REPORTS 400–409 (1995) (Ex. 1003).

⁴ We refer to the remaining parties, listed in the Caption above, collectively, as “Petitioner” throughout this Decision.

⁵ The oral arguments for IPR2014-00781, IPR2014-00782, IPR2014-00800, IPR2014-00802, IPR2014-00805, IPR2014-01083, IPR2014-01086, and IPR2014-01087 were consolidated.

a well-known technique for depositing films on semiconductor substrates. *Id.* at 1:15–16. As discussed in the '421 patent, prior art magnetron sputtering systems deposited films having low uniformity, poor target utilization (the target material erodes in a non-uniform manner), and relatively low deposition rate (low amount of material deposited on the substrate per unit time). *Id.* at 1:63–2:14. The '421 patent discloses that increasing the power applied to the plasma, in an attempt to increase the target utilization and sputtering yield, can also “increase[] the probability of establishing an undesirable electrical discharge (an electrical arc) in the process chamber.” *Id.* at 3:20–29.

The '421 patent further discloses that using pulsed power can reduce the probability of establishing an electrical breakdown condition, but that large power pulses still can result in undesirable electrical discharges. *Id.* at 3:30–38. According to the '421 patent, however, first forming a weakly-ionized plasma “substantially eliminates the probability of establishing a breakdown condition in the chamber . . . when high-power pulses are applied between the cathode . . . and the anode.” *Id.* at 9:16–19. Once a weakly-ionized plasma is formed, high-power pulses are applied between the cathode and anode to generate a strongly-ionized plasma from the weakly-ionized plasma. *Id.* at 9:29–31, 10:8–9. The “probability of establishing a breakdown condition is substantially eliminated because the weakly-ionized plasma has a low-level of ionization that provides electrical conductivity through the plasma. This conductivity greatly reduces or

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