Trials@uspto.gov
571-272-7822

Paper 55
Entered: September 23, 2015

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 IPR2014-00807[1]
Patent 7,604,716 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
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

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[1] Cases IPR2014-00846, IPR2014-00974, and IPR2014-01065 have been joined with the instant proceeding.

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 14–18 and 25–32 of U.S. Patent No. 7,604,716 B2 (Ex. 1201, "the '716 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 14–18 and 25–32 ("the challenged claims") of the '716 patent. TSMC included a Declaration of Uwe Kortshagen, Ph.D. (Ex. 1202) to support its positions. Zond ("Patent Owner") filed a Preliminary Response (Paper 9,[2] "Prelim. Resp."). Pursuant to 35 U.S.C. § 314(a), on October 14, 2014, we instituted an *inter partes* review of the challenged claims to determine if the claims are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Wang[3] and Kudryavtsev.[4] Paper 10 ("Inst. Dec.").

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[2] Patent Owner filed two copies of the Preliminary Response, which appear to be identical. *See* Papers 8, 9. We refer to the copy filed as Paper 9 throughout the Decision.
[3] U.S. Patent No. 6,413,382 B1, issued July 2, 2002 (Ex. 1204).
[4] A.A. Kudryavtsev and V.N. Skerbov, *Ionization Relaxation in a Plasma Produced by a Pulsed Inert-Gas Discharge*, 28 SOV. PHYS. TECH. PHYS. 30–35 (Jan. 1983) (Ex. 1205).

Subsequent to institution, we granted revised Motions for Joinder filed by other Petitioners listed in the Caption above, joining Cases IPR2014-00846, IPR2014-00974, and IPR2014-01065 with the instant trial (Papers 13–15), and also granted a Joint Motion to Terminate with respect to TSMC (Paper 37).[5] Patent Owner filed a Patent Owner Response (Paper 29, "PO Resp."), along with a Declaration of Larry D. Hartsough, Ph.D. (Ex. 2004) to support its positions. Petitioner filed a Reply (Paper 46, "Reply") to the Patent Owner Response, along with a supplemental Declaration of Dr. Kortshagen (Ex. 1221). An oral hearing[6] was held on June 12, 2015. A transcript of the hearing is included in the record. Paper 54 ("Tr.").

B. Related Proceedings

The parties indicate that the '716 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 '716 Patent

The '716 patent relates to a method and apparatus for generating a strongly-ionized plasma, for use in various plasma processes. Ex. 1201, Abstract, 7:30–47. For example, at the time of the invention, plasma sputtering was a widely used technique for depositing films on substrates. *Id.* at 1:24–25. As discussed in the '716 patent, prior art magnetron

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[5] We refer to the remaining parties, listed in the Caption above, collectively, as "Petitioner" throughout this Decision.

[6] The oral arguments for IPR2014-00807, IPR2014-00808, IPR2014-00818, IPR2014-00819, IPR2014-00821, IPR2014-00827, IPR2014-01098, IPR2014-01099, and IPR2014-01100 were consolidated.

sputtering systems deposited films having low uniformity and poor target utilization (the target material erodes in a non-uniform manner). *Id.* at 3:20–33. The '716 patent discloses that increasing the power applied to the plasma, in an attempt to increase the plasma uniformity and density, can also "increase the probability of generating an electrical breakdown condition leading to an undesirable electrical discharge (an electrical arc) in the chamber." *Id.* at 3:34–40.

The '716 patent further discloses that using pulsed DC power can reduce the probability of establishing such an electrical breakdown condition, but that large power pulses still can result in undesirable electrical discharges. *Id.* at 3:42–52. According to the '716 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 6:16–19. 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 substantially prevents the setup of a breakdown condition, even when high power is applied to the plasma." *Id.* at 6:20–25.

D. Illustrative Claims

Of the challenged claims, claims 14 and 26 are independent. Claims 15–18 and 25 depend from claim 14. Claims 27–32 depend from claim 26. Claims 14 and 26 are illustrative, and are reproduced as follows:

> 14. A method for generating a strongly-ionized plasma, the method comprising:
>
> a. ionizing a feed gas in a chamber to form a weakly-ionized plasma that substantially eliminates the probability of developing an electrical breakdown condition in the chamber; and
>
> b. supplying an electrical pulse across the weakly-ionized plasma that excites atoms in the weakly-ionized plasma, thereby generating a strongly-ionized plasma without developing an electrical breakdown condition in the chamber.

Ex. 1201, 21:1–11.

> 26. An apparatus for generating a strongly-ionized plasma, the apparatus comprising:
>
> a. an anode;
>
> b. a cathode that is positioned adjacent to the anode;
>
> c. an ionization source that generates a weakly-ionized plasma proximate to the cathode, the weakly-ionized plasma substantially eliminating the probability of developing an electrical breakdown condition between the anode and the cathode; and
>
> d. a power supply that is electrically coupled to the anode and to the cathode, the power supply generating an electric field that excites atoms in the weakly-ionized plasma, thereby forming a strongly-ionized plasma without developing an electrical breakdown condition in the chamber.

Id. at 22:1–15.

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