

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY, INC.,
Petitioner,

v.

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,
Patent Owner.

Case IPR2017-00662
Patent 6,969,539 B2

Before CHRISTOPHER L. CRUMBLEY, JON B. TORNQUIST, and
CHRISTOPHER M. KAISER, *Administrative Patent Judges*.

KAISER, *Administrative Patent Judge*.

DECISION
Denial of Request for Rehearing
37 C.F.R. § 42.71(d)

INTRODUCTION

Micron Technology, Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 24, 26, and 29 of U.S. Patent No. 6,969,539 B2 (Ex. 1001, “the ’539 patent”). The President and Fellows of Harvard College (“Patent Owner”) filed a Preliminary Response (Paper 8, “Prelim. Resp.”). After considering the Petition, the Preliminary Response, and the evidence of record, we determined that Petitioner had demonstrated that there was a reasonable likelihood that it would prevail with respect to at least one of the claims challenged in the Petition. Paper 11, 19.

Accordingly, we instituted *inter partes* review to determine whether claims 24, 26, and 29 of the ’539 patent are unpatentable either as anticipated by Buchanan¹ or as obvious over the combination of Buchanan and the knowledge of a person of ordinary skill in the art. *Id.* at 19–20. Patent Owner now requests that we rehear our decision to institute *inter partes* review. Paper 14 (“Request”).

We will grant a request for rehearing of a petition decision if the requesting party demonstrates “an abuse of discretion” in the decision. 37 C.F.R. § 42.71(c). That party must also “specifically identify . . . the place where each matter [that we misapprehended or overlooked] was previously addressed.” *Id.* § 42.71(d). After considering Patent Owner’s request for rehearing, our decision, and the evidence currently of record, we determine Patent Owner has not demonstrated an abuse of discretion. Accordingly, we deny the request for rehearing.

¹ Buchanan et al., U.S. Patent No. 6,984,591 B1, issued Jan. 10, 2006 (Ex. 1005, “Buchanan”).

ANALYSIS

A. Anticipation by Buchanan

Patent Owner argues that we abused our discretion by instituting review with respect to the asserted anticipation of claims 24, 26, and 29 by Buchanan. Request 4–11. Specifically, Patent Owner argues first that we “misinterpreted Buchanan’s disclosure” and second that we were incorrect in relying on *In re Petering*, 301 F.2d 676 (CCPA 1962), to determine that Petitioner had made a sufficient showing to demonstrate a reasonably likelihood of succeeding in showing that Buchanan anticipates claims 24, 26, and 29. In addition, Patent Owner argues that it was error to rely on the testimony of Petitioner’s declarant, Dr. Banerjee.

1. Disclosure of Buchanan

Buchanan makes several disclosures relevant to the claims Petitioner challenges in this proceeding. First, Buchanan discloses an “inventive method” for depositing a metal, metal oxide, or metal nitride film on a substrate using atomic layer deposition. Ex. 1005, 19:60–21:2. This method alternately exposes a heated substrate to a “precursor source mixture” and a “reactant.” *Id.* at 20:7–49. The reactant is chosen depending on whether a metal, metal oxide, or metal nitride film is to be deposited, and “[t]he preferred [reactant for an oxide film] is water.” *Id.* at 20:16–20. In the specific example of Buchanan, two precursor source mixtures—zirconium nitrate in pentane and hafnium tertbutoxide in pentane—are used, resulting in a film that is a mixture of zirconium and hafnium, or zirconium oxide and hafnium oxide, or zirconium nitride and hafnium nitride, depending on the particular reactant chosen. *Id.* at 20:1–11. Second, Buchanan discloses that its “inventive method . . . can be expanded to include growth of any single

component metal, metal oxide, metal nitride or metal silicide film deposited by atomic layer deposition utilizing one precursor source mixture which contains only one precursor.” *Id.* at 20:63–67.

Third, Buchanan discloses a class of precursor source mixtures, each comprising “at least one precursor” and “an inert liquid.” *Id.* at 5:18–21.

The “precursor” of Buchanan

is defined as any compound which contains an element selected from the group consisting of Li, Na, K, Rb, Cs, Fr, Be, Mg, Ti, Zr, Hf, Sc, Y, La, V, Nb, Ta, Cr, Mo, W, Mn, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, Tl, Si, Ge, Sn, Pb, As, P, Sb and Bi, to which is bound at least one ligand selected from the group consisting of hydride (H), alkyl (CR₃), alkenyl (CRCR₂), cycloalkenyl, aryl, alkyne (CCR), carbonyl (CO), amido (NR₂), imido (NR), hydrazido (NRNR₂), phosphido (PR₂), nitrosyl (NO), nitryl (NO₂), nitrate (NO₃), nitrile (RCN), isonitrile (RNC), halide (F, Cl, Br, or I), azide (N₃), alkoxy (OR), siloxy (OSiR₃) silyl (SiR₃), and halogenated, sulfonated or silyated derivatives thereof and when delivered to a vaporizer the precursor is readily converted into gaseous form.

Id. at 5:22–37. The “inert liquid” of Buchanan “is defined as any liquid which does not decompose when in contact with the precursor of the present invention during storage and during vaporization of the precursor.” *Id.* at 7:4–7. “The precursor source mixture of [Buchanan] can be used in any CVD or ALD process with any delivery means currently employed.” *Id.* at 7:30–32.

Fourth, Buchanan discloses a subclass of precursors that are “preferred.” *Id.* at 5:66–7:3. These “preferred” precursors include “tetrakis(dimethylamino), [and] tetrakis(diethylamino) Ti, Zr, Hf, Si, Ge, Sn, or Pb.” *Id.* at 5:67–6:1, 6:45–47. In addition, “tetrakis(dimethylamino), [and] tetrakis(diethylamino) Ti, Zr, Hf, Si, Ge, Sn, or Pb” are described,

when “dissolved, emulsified or suspended in a C₅–C₁₂ alkane liquid with additional amine,” as “[h]ighly preferred precursor source mixtures comprised of at least one amino-containing precursor.” *Id.* at 14:55–58, 15:1–2.

Fifth, Buchanan discloses that certain types of precursors used in prior-art chemical vapor deposition and atomic layer deposition processes suffer from particular disadvantages. *Id.* at 1:28–3:47. In particular, Buchanan discloses that “alkoxides . . . are known to change their chemical state by ligand rearrangement, hydrolysis, [oligomerization], ring formation, cluster formation, and/or oxidation over time” and “are particularly sensitive to water and oxygen impurities which may be inadvertently introduced.” *Id.* at 2:23–35. In addition, Buchanan discloses that “[a]lloxides . . . may exist in a number of isomeric forms which interconvert over time resulting in a variable vapor pressure.” *Id.* at 2:36–44. Buchanan also discloses that “amides . . . behave similarly to alkoxides, being prone to” the same disadvantages disclosed for those compounds. *Id.* at 2:45–49. Finally, Buchanan discloses that “anhydrous metal nitrates such as titanium nitrate, zirconium nitrate and gallium nitrate . . . are air and water sensitive and are known to decompose at temperatures around 100° C.” *Id.* at 2:49–53.

2. *Asserted Misinterpretation of Buchanan’s Disclosure*

Patent Owner argues that we misinterpreted Buchanan’s disclosure as sufficient to show a reasonable likelihood of anticipation of claim 24 (and its dependent claims 26 and 29). Request 4–7. In particular, Patent Owner argues that Buchanan should not be interpreted as “disclos[ing] a list of precursors that can be used in Example 3 to grow a metal oxide film deposited by atomic layer deposition.” *Id.* at 5.

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