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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY, INC., INTEL CORPORATION

AND GLOBALFOUNDRIES U.S., INC.

Petitioners

v.

DANIEL L. FLAMM,

Patent Owner

CASE IPR2017-00392
U.S. Patent No. 5,711,849

DECLARATION OF DANIEL L. FLAMM IN SUPPORT OF PATENT OWNER'S RESPONSE

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Exhibit 2003

I, Daniel L. Flamm, Sc.D., hereby declare as follows:

1. I worked in academia, research, and industry in various roles for more than 50 years. My curriculum vitae, which includes a more detailed summary of my background, experience, and publication, is attached as Appendix A.

2. I have been a leading researcher and educator in the fields of semiconductor processing technology, air pollution control, materials science, and other areas of chemical engineering. My research has been funded by NASA, National Science Foundation, Environmental Protection Agency, and AT&T Bell Laboratories. While a Distinguished Member of Technical Staff at Bell Laboratories, I led a semiconductor processing research group comprised of research colleagues, visiting university scientists, post-doctoral associates, and summer students. I have also served as a technical consultant to various semiconductor device and processing equipment manufactures.

3. I have published over one hundred and fifty (150) technical journal articles and books, and dozens of articles in conference proceedings, most of them in highly competitive referred conferences and rigorously reviewed journals. I am an inventor listed in more than 20 U.S. patents, a number of which have been licensed through the industry, and most being in the general field of semiconductor processing technology.

4. I had experience studying and analyzing patents and patent claims from the

perspective of a personal having ordinary skilled in the art ("PHOSTIA") starting at least at the time of my employment at AT&T Bell laboratories in 1977. At AT&T Bell Laboratories, I served as a member of the patent licensing review committee where I was responsible for reviewing hundreds of patents for potential utility and licensing potential. I have also served as a technical expert in patent disputes and litigation.

5. I was admitted to the patent bar as an Agent in 2003 and have been registered as a Patent Attorney since 2006. I am also a member of the California State Bar.

6. I am the inventor of U.S. Patent No. 5,711,849, in the name of Daniel L Flamm and titled "("the '849 Patent").

7. I have read the Petitioners Petition for *Inter Partes* Review in this matter and the various art cited therein, including, among others,

8. Petitioner contends that the combination of Alkire and Kao discloses or suggests all of the elements of claim 1. I, however, respectfully disagree.

9. Alkire does not teach "defining etch rate data comprising an etch rate and a spatial coordinate which defines a position within said relatively non-uniform etching profile on said substrate" as admitted by Petitioner. Additionally, Figure 2 of Alkire shows a uniform etching profile.

10. As shown in Figure 2, Alkire's etching profile is completely flat except for edges of the film, which is typical before or after etching the wafer, and is not a

relatively non-uniform etch profile. Also, Alkire solves for "r" along the length of the wafer. Alkire emphasizes a "uniform" etching profile in its Abstract, and throughout the Alkire document. A PHOSITA would never be able to extract a surface reaction rate constant from this profile, even if the flat profile included etch data, since a flat profile would not yield a surface reaction rate constant using any of a model disclosed in Alkire or Kao. Additionally, as shown in Figure 2, the two films face each other in Alkire, which would give a different model than Flamm or even Kao. Moreover, Petitioner even acknowledges that "Alkire does not explicitly disclose measuring the etch rate at any spatial coordinates" in Petitioner's paper.

11. Furthermore, Alkire's model lacks any temperature dependence, express or otherwise, to extract the claimed surface reaction rate constant, which is temperature dependent. That is, Alkire assumes "operation is isothermal" [Alkire p. 649 second column] and excludes any temperature dependence from his model. At most, Alkire mentions in his conclusion section that because "chemical reactions are affected by temperature, the rate constant (k_2) may not be a constant." The extracted surface reaction rate constant that is claimed in the '849 Patent, on the other hand, is an Arrhenius expression depending on temperature. ['849 column 7, lines 10-14]. (Note that the term "surface reaction rate constant" has a dual meaning, namely: a value of the constant corresponding to a selected value

of temperature, and the function "surface reaction rate constant" which can be written as an Arrhenius expression depending on temperature.) The claimed surface reaction rate constant, that is extracted is the function, as is explicitly taught at column 9, for example, of the '849 patent. The '849 patent expressly requires k(T) to select uniformity conditions for the fabrication of a device [see, Figs. 3-5, for example]. Alkire's model fails to teach the claimed surface reaction rate constant and would be useless to practice the '849 patent. Also, Kao focuses on non-uniformity of wafers along a reactor not within the wafer so solves for a completely different problem using a different model. Kao also fails to show or suggest any relatively non-uniform etch profile as claimed, but rather shows non-uniformity of wafers along spatial regions of the reactor. Kao also shows non-symmetric etching rates, which would not be useful in any of Alkire's models. Accordingly, Alkire and Kao lacks the fundamental elements of claim 1 of the '849 Patent.

12. It would have not been obvious for a PHOSITA to combine Alkire with the experimental measurement of reaction rate and the use of that data in modeling as taught by Kao. As shown above in Figure 2, Alkire relies upon a set up for an etching process having two wafer faces facing each other to formulate a model. Kao, however, uses the following radial flow reactor in Figure 1 for silicon based etching using a different combination of etching gases. Kao emphasizes solving

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