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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION GLOBALFOUNDRIES U.S., INC.

AND MICRON TECHNOLOGY, INC.,

Petitioners

v.

DANIEL L. FLAMM,

Patent Owner

CASE IPR2017-00282[1]
U.S. Patent No. RE40,264 E

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

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[1] [1] Samsung Electronics Company, Ltd. Was joined as a party to this proceeding via a Motion for Joinder in IPR2017-01752

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 manufacturers.

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. RE40,264E, in the name of Daniel L Flamm and titled "("the '264 Patent").

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

8. The '264 patent describes methods of fabricating semiconductors, preferably using a plasma discharge. Multiple substrate temperatures are employed in a continuous process for etching films, where temperature changing is achieved within a preselected time period.

9. Low temperatures generally results in slower processing. The present invention can overcome these disadvantages of conventional processes by rapidly removing a majority of material at a higher temperature after an ion implanted resist layer is removed without substantial particle generation at a lower

temperature (*id*. at 2:26-30) The invention achieves "high etch rates while simultaneously maintaining high etch selectivity..." (*id*. at 2:32-33).

10. While methods involving the use of various temperatures for manufacturing semiconductors were known in the art prior to the '264 patent, none of the prior art discloses etching or processing where the temperature of the substrate is changed "within a preselected time interval for processing" (Claim 27) or "within a preselected time period to process the film" (Claim 37) in the manner claimed.

11. Kadomura teaches a cryogenic two-step etching treatment, wherein the etching is suspended between the first and second etches. During the suspension, the first etching gas is discharged and is replaced by a second etching gas for the second etching step. In this case, since the series of operations described above is a series of operations of interrupting discharge, exhausting remaining gases in the diffusion chamber and, further, introducing and stabilizing a fresh etching gas take a time equal with or more than the time required for rapid cooling, the time required for the rapid cooling does not constitute a factor of delaying the time required for the etching treatment of the specimen. Kadomura teaches nothing about a preselected time interval for changing temperature and specifically teaches that while the temperature is being changed, no processing is performed. The maximum time interval available for the temperature change in Kadomura is a function of the time it takes to discharge

the first gas, and then to introduce the second gas and stabilize the second gas. There would be no benefit from attempting to preselect a time period to change the Kadomura temperature since there is no processing during the temperature change that would be affected by the duration of the change, and foreshortening the time for changing temperature would not otherwise improve the Kadomura process.) At the time of the '264 invention, cryogenic etching was merely a laboratory curiosity that had been impractical owing to its various requirements to use ultracold fluids and gases, the difficulties in finding production worthy materials that could tolerate repeated cycling between room and low temperature without premature deterioration, brittle fractures, and leaks, and the relatively long times required to effectuate heating, cooling, and equilibration to attain sufficiently uniform and stable substrate temperatures. The objects of the Kadomura cryogenic etching process were to attain "high accuracy and fine fabrication simultaneously, as well as actually putting the low temperature etching technique into practical use." By contrast, my primary objectives was to increase throughput and selectivity of conventional plasma processes: "[the invention] overcomes serious disadvantages of prior art methods in which throughput and etching rate were lowered in order to avoid excessive device damage to a workpiece." (Ex. 1001 at 2:11-14) Kadomura's technique of exhausting and replacing the gas between etches and employing very cold

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