Database need for semiconductor plasma-processing

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In a usual semiconductor fabrication, each step of the plasama processings needs the process-time on the order of minutes. The time constant has a great influence both on the gas phase and on the material surface. Under these circumstances, we have to consider two specific phenomena when we simulate or predict a plasma processing for materials.

One is the temporal change of the feed gas molecules by way of the collisional dissociation, typically in a high density plasma. The other is the temporal change of the surface property. That is, the material surface exposed to a low temperature reactive plasma is covered by a proper molecules. Therefore, the etch yield of an ion for the clean surface of the material, i.e., physical sputtering yield, is incapable of predicting the practical yield[1, 2].

On the other hand, plasma process is a competitive process between deposition and etching caused by active ions and neutral radicals incident on the surface. For dielectric material, in particular, the surface process is competition among etching, deposition and charging[2].

We will show and discuss the practical etching employed in semiconductor manufacturing industry from the viewpoints of the database of the plasma processing.

Reference

[1] T. Makabe and Z. Petrovic, "Plasma Electronics: Applications in Microelectronic Device Fabrication", New York and London, Taylor & Francis (2006).

[2] T. Makabe and T. Yagisawa, Plasma Sources Sci. Technol. **18**, 014016 (2009).