Angular dependence of SiO_2etch rates in hexafluoroisopropanol plasmas

Jin-Su Park [1], Jun-Hyun Kim [1], and Chang-Koo Kim [1]

[1]*Ajou University, Korea, Republic of*

Plasma etching is widely used to pattern SiO_2contact holes. Precise control over etch profiles is strictly required for SiO_2 contact etching as the minimum feature size keeps shrinking. To predict and control the etch profiles, information on the dependence of etch rates on the direction of ions incident on the substrates is indispensable. A Faraday cageis known to allow accurate control over the directions of the ions incident on the substrate surface during plasma etching.

Perfluorocarbons (PFCs) such as CF_4 and C_4F_8 are widely used as etchant gases for contact hole etching. These PFCs, however, are considered to be problematic from an environmental view point because of their long atmospheric lifetimes and high global warming potentials (GWP). Therefore, the investigation of alternative etchants to the established and conventionalPFC gases is important from an environmental point of view.

In this work, the angular dependence of SiO_2etch rates was investigated in hexafluoroisopropanol (HFIP, $C_3H_2F_6O$)plasmas using a Faraday cage system. The GWP value of this fluorinated alcoholis ~3, which is much lower than those of the PFC gases currently used in the fabrication of microelectronic devices. The etch mechanisms of HFIP was compared to that of C_4F_8 (one of the conventional PFCetchants) based on the respective angular dependence of etch rates.

This work was supported by the the Korea Institute of Energy Technology Evaluation and Planning(KETEP) grant funded by the Korea Goverment Ministry of Trade, Industry and Energy.(20172010104830)