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Reaction model for etching surface interacted with hydrofluorocarbon plasmas KENJI ISHIKAWA, YUSUKE KONDO, YUDAI MIYAWAKI, TOSHIO HAYASHI, MAKOTO SEKINE, KEIGO TAKEDA, HIROKI KONDO, MASARU HORI, Nagoya University — We report a model for plasma etching on the basis of understanding interactions between hydrofluorocarbon plasmas and dielectric surface. To construct the model, we carried out quadpole mass spectroscopic measurements of cracking patterns with changing electron energy of ionization, and estimated the cross-sections for ionizing dissociation of gases such as CH_xF_{4-x} (x:1-3) molecules. Assuming a electron temperature, rate constants for these reactions were calculated by integrating over whole electron energy range. Next we made comparison in performance for plasma etching among CHF_3, CH_2F_2 and CH_3F gases by measuring densities of both ions and radicals and compared the results of etch rate with the results of the densities of the species in gas phase. For CHF_3, CH_2F_2 and CH_3F molecules, hydrogen atom was dissociated easier than fluorine atom. Cross section is ordered by $CH_3F > CH_2F_2 > CHF_3$. According to the experimental results, the chemical reaction model was constructed and we have evaluated interaction of dielectric surface with hydrofluorocarbon plasmas.

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