

Abstract Submitted
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Student Excellence Award Finalist: Neutral production in $\text{SF}_6/\text{SiCl}_4$ inductively coupled plasmas C. DULUARD, R. DUSSART, L.E. PICHON, E.H. OUBENSAID, P. LEFAUCHEUX, P. RANSON, GREMI, Orleans, M. PUECH, Alcatel Micro Machining Systems — In this study we investigate the mechanisms involved during silicon etching by $\text{SF}_6/\text{SiCl}_4$ mixtures in an industrial inductively coupled plasma reactor. To that purpose, the plasma is analysed by mass spectrometry and optical emission spectroscopy. Relative concentrations of reactive neutrals such as F and Cl are determined using the actinometry technique. Neutral species are also monitored in the diffusion chamber by a quadrupole mass spectrometer whose ionisation energy is set to 70 eV. At this energy, the ionisation of molecules is mostly dissociative and produces several ions of lower mass. Therefore, a detected ion can stem from various molecules. Knowledge of the fragmentation spectra for different molecules is thus crucial to deduce the contribution of all the species, either being the primary gas molecules (e.g. SF_6 , SiCl_4) or the resultant radicals (e.g. SF_4 , SiCl_2). The study focuses on the influence of the gas flow rate on the evolution of neutral concentrations. Other parameters such as pressure and source power are fixed in the 1-10 Pa range and 800-3000 W range respectively. All these experiments are compared between the case of a bare and an oxidised silicon wafer, so as to distinguish silicon-enhanced reactions from plasma-phase and other surface reactions.

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