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Control of radical and ion production in chlorine plasma[1] DAVID CARON, EARL SCIME, West Virginia University, COSTEL BILOIU, Applied Materials — Chlorine gas is widely used in the nanochip industry for ion etching of silicon wafers. As feature sizes on chips shrink, greater control of ion production is needed. Despite its popularity as an etching gas, it is difficult to control the dissociation and densities of ions and radicals. In this work, rare gas actinometry is used to determine an absolute number density for Cl_2. Plasma parameters are then varied to control chlorine densities. We focus on obtaining the measurements using an argon or krypton dopant while confirming previous work done with xenon. Density measurements are achieved by comparing the relative peak intensities produced in an inductively coupled chlorine plasma mixed with 5% rare gas. The plasma is sampled using line-of-sight spectroscopy in the source and across a blank silicon wafer. The benefit of creating a scheme for these rare gases is that argon and krypton provide stronger spectral lines and are cheaper than xenon. This work demonstrates a method for chlorine ion and radical production that will allow the precise control needed for nanochip etching.

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