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Vacuum ultraviolet photon fluxes in argon-containing inductively coupled plasmas[1] S.B. RADOVANOV, H.M. PERSING, Applied Materials, Silicon Systems Group, Varian Semiconductor Equipment, S. WANG, C.L. CULVER, J.B. BOFFARD, C.C. LIN, A.E. WENDT, University of Wisconsin-Madison — Vacuum ultraviolet (VUV) photons emitted from excited atomic states are ubiquitous in material processing plasmas. Damage of materials is induced by energy transfer from the VUV photons to the surface, causing disorder in the surface region, surface reactions, and affecting bonds in the material bulk. Monitoring of the surface flux of VUV photons from inductively coupled plasmas (ICP) and its dependence on discharge parameters is thus highly desirable. Results of non-invasive, direct windowless VUV detection using a photosensitive diode will be presented. Relative VUV fluxes were also obtained using a sodium salicylate coating on the inside of a vacuum window, converting VUV into visible light detected through the vacuum window. The coating is sensitive to wavelengths in the range 80-300 nm, while the photodiode is only sensitive to wavelengths below 120 nm. In argon the VUV emissions are primarily produced by spontaneous decay from $3p^5 4s$ resonance levels ($1s_2$,$1s_4$) and may be reabsorbed by ground state atoms. Real-time resonance level concentrations were measured [1] and used to predict the VUV photon flux at the detector for a range of different ICP pressures, powers, and for various admixtures of Ar with N_2, and H_2.

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