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Plasma-Surface Interactions and Impact on Electron Energy Distribution Function N.A. FOX-LYON, G.S. OEHRLEIN, University of Maryland, College Park, N. NING, D.B. GRAVES, University of California, Berkeley, V. GODYAK, RF Plasma Consulting — The goal of this work is to explore the role of surface processes in influencing characteristic electron energy distribution functions (EEDF).As a model system, we use a well characterized, inductively coupled plasma system to examine Ar/H_2 (or D_2) discharges interacting with a-C:H films. The modification/erosion of a-C:H surfaces is monitored in real time by ellipsometry and the effects of gas mixtures and surface generated carbon on plasma parameters (T_e, plasma density, EEDF) are probed with Langmuir probe measurements. We find that plasma density decreased greatly (from 10^{11} to 10^9 per cm^3) with small H_2 additions to Ar plasma (conditions: 10-30 mTorr, 300-600 W source power). The electron temperature was shown to increase with H_2 flow. At high H_2 flows, the electron energy distribution transitions from Maxwellian distribution to a two-temperature distribution. The addition of 1-20 % CH_4 into H_2 plasma shows an increase in plasma density and a change in the electron temperature. The hydrocarbon erosion products of a-C:H films in H_2 plasma are found to cause a similar effect on plasma properties as CH_4 addition. These observations indicate that prediction/control of EEDF for plasmas interacting with reactive bounding surfaces requires an understanding of the consequences of the plasma-surface interactions.

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