GEC11-2011-000052

Abstract for an Invited Paper
for the GEC11 Meeting of
the American Physical Society

Correlating Gas-Phase Energetics of Plasma Radicals with Surface Interaction Data[1]

ELLEN R. FISHER, Colorado State University

Understanding how energy is distributed within a plasma and the specific contributions of gas-phase species to plasma processing is key to understanding the chemistry that leads to specific surface modifications. The surface interactions of gas-phase plasma species provide critical molecular level information on plasma processing, especially at interfaces. Clearly, power dissipation and energetics are also important for elucidation of mechanistic details in plasmas. The imaging of radicals interacting with surfaces (IRIS) technique uses laser-induced fluorescence to provide spatially-resolved images of plasma species and direct information on the energetics of plasma-generated and surface-scattered radicals. Combined with optical emission spectroscopy, we have measured the internal and translational temperatures for a range of species in several plasma environments. This work concentrates on NO, SiF, and CF radicals in a range of plasmas, although comparisons to other radicals will also be made. For many of these molecules, vibrational temperatures are significantly higher than rotational temperatures and energy partitioning is correlated to surface reactivity. The gas-phase data are complemented by materials analysis data that reveal a more detailed picture of the overall plasma process.

[1]Work supported by the National Science Foundation (NSF-0911248).