GEC15-2015-000569

Abstract for an Invited Paper
for the GEC15 Meeting of
the American Physical Society

**The Empowerment of Plasma Modeling by Fundamental Electron Scattering Data**[1]

MARK J. KUSHNER, University of Michigan

Modeling of low temperature plasmas addresses at least 3 goals – investigation of fundamental processes, analysis and optimization of current technologies, and prediction of performance of as yet unbuilt systems for new applications. The former modeling may be performed on somewhat idealized systems in simple gases, while the latter will likely address geometrically and electromagnetically intricate systems with complex gas mixtures, and now gases in contact with liquids. The variety of fundamental electron and ion scattering data (FSD) required for these activities increases from the former to the latter, while the accuracy required of that data probably decreases. In each case, the fidelity, depth and impact of the modeling depends on the availability of FSD. Modeling is, in fact, empowered by the availability and robustness of FSD. In this talk, examples of the impact of and requirements for FSD in plasma modeling will be discussed from each of these three perspectives using results from multidimensional and global models. The fundamental studies will focus on modeling of inductively coupled plasmas sustained in $Ar/Cl_2$ where the electron scattering from feed gases and their fragments ultimately determine gas temperatures. Examples of the optimization of current technologies will focus on modeling of remote plasma etching of Si and $Si_3N_4$ in $Ar/NF_3/N_2/O_2$ mixtures. Modeling of systems as yet unbuilt will address the interaction of atmospheric pressure plasmas with liquids

[1]Work was supported by the US Dept. of Energy (DE-SC0001939), National Science Foundation (CHE-124752), and the Semiconductor Research Corp.