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Electron Collisions with Atoms and Molecules Relevant to Industrial, Planetary and Astrophysical Plasmas.¹
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Collision processes involving electrons with neutral atoms and molecules are among the principal mechanisms for energy exchange in industrial and naturally occurring plasmas. In many of these plasmas, large populations of low energy, secondary electrons are generated. Such secondary electrons are very effective in many of the relevant collision processes because both the cross sections and the electron energy distributions peak at low energies. In this talk, a series of experiments involving electron collisions with atomic oxygen, vibrationally excited molecular hydrogen and molecular nitrogen will be presented. Electron collisions with these species are of particular importance in planetary plasmas as demonstrated by, for example, the auroral phenomena at Earth and Jupiter, the electroglow of Jupiter, Saturn and Uranus, and UV emission from Earth, Titan and Triton, respectively. Further, such interactions are important in plasma processing of textile materials, nitrogen gas lasers, and fusion plasmas. The experiments to be presented involve two main experimental techniques (1) electron energy loss spectroscopy and (2) electron impact induced emission spectroscopy.

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