

GEC12-2012-000200

Abstract for an Invited Paper
for the GEC12 Meeting of
the American Physical Society

State-of-the-Art Experimental Techniques and Results for Low Energy Electron Collisions with Simple Molecules¹

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Electron collisions with simple molecular systems (diatomics and small polyatomics) play an important role in most discharge-based devices and environments. Even in cases where large precursor molecules are involved, say for example in a plasma processing environment, dissociation and dissociative attachment lead to the production of smaller molecules, perhaps radicals, whose interactions can then play an important part in the dynamics of the discharge. This paper will attempt to describe the current state of the art for measurements of processes such as elastic scattering, rotational, vibrational and electronic excitation, dissociative attachment, and ionization of small molecular species by electron impact. Examples of absolute cross sections that arise from such measurements will be provided and compared, where possible, with contemporary theoretical calculations. The collaboration between experiment and theory is of critical importance in the context of “Plasma Data Exchange,” as benchmarked theory will play an significant role in providing data for the many, perhaps majority, of processes that cannot be easily measured.

¹Supported by the Australian Research Council.