Electron Swarm Parameters and Electron Collision Cross Sections

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Electron collision cross section data for atoms and molecules and electron swarm data in respective gases are important for quantitative modeling of related plasmas. This fact and wide application of plasmas in various fields boos data collection and evaluation activities worldwide.

We have been measuring electron swarm parameters (drift velocity, longitudinal diffusion coefficient, ionization/attachment coefficients, and so on) over a wide *E/N* range (where *E* is the electric field and *N* the gas number density) in a number of gases. We also derived a set of electron collision cross sections for each gas so that the set was consistent with our experimental swarm data. Our speciality in studying molecular target is to measure swarm parameters not only in the pure molecular gas but also in dilute molecular gas-argon gas mixtures, the mix rations of the molecule are 0.5-5.0%. The swarm parameters in pure molecular gas depend primarily on the elastic momentum transfer cross section of the molecule and its vibrational excitation cross sections. Those in the mixtures, on the other hand, depend mainly on the elastic momentum transfer cross section of major argon atom and the vibrational cross sections of minor admixed molecule. Alternative use of swarm parameters in pure molecular gas and those in the mixtures enable us to derive the momentum transfer cross section and vibrational cross sections for the molecule separately. Combination of the Ramsauer-Townsend minimum of argon atom and sharp structures in vibrational cross sections of the molecule frequently gives rise prominent *E/N* dependences in swarm parameters, which can be used to determine the position and magnitude of resonances in the vibrational excitation cross sections. Detailed accounts of the procedure, including estimated uncertainty in our electron swarm data and also in the resultant set of electron collision cross sections, will be given in the presentation by referring to our recent results. Stress will be placed on the necessity of cooperation among swarm, beam and theory groups.