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Collisions between low-energy electrons and small polyatomic targets of biological relevance

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Over the last decade, cross section measurements and calculations for DNA prototype molecules have received significant attention from the collisions community, due to the potential applications of this data in modelling electron transport through biological matter with a view to improving radiation dosimetry. Such data are additionally interesting from a fundamental aspect, as small carbon-based molecules are ideal targets for considering effects including target conformation, long-range dynamical interactions and coupling effects between the various degrees of freedom on the scattering properties of the target. At the California State University Fullerton, we have made a series of measurements of the elastic, vibrationally inelastic and electronically inelastic cross sections for a variety of small polyatomic targets, including water and the basic alcohols, ethylene, toluene and several fluorinated alkanes. These processes are important in a range of applications, primarily for modelling electron transport and thermalization, and energy deposition to a biological media. The data were obtained using a high resolution electron energy-loss spectrometer, operating in a crossed beam configuration with a moveable aperture gas source. The gas source design facilitates both an expedient and highly accurate method of removing background signal, and removes uncertainties from the data due to uncertainties in the beam profile. We have also performed scattering calculations employing the Schwinger Multichannel method, in collaboration with the California institute of technology, to compare with our measurements. In this talk, I will present an overview of our recent data and future research plans.