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Electron-Impact Ionization Cross Sections of Molecules and Ions in Fusion Plasma

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Electron-impact cross sections yield the probability of an electron reacting with a particle –a molecule, an ion or an atom –as a function of the energy of that electron.
At low energies so-called dissociative electron attachment (DEA) is the predominant reaction mechanism.
At energies of the incoming electron higher than the ionization threshold of the particle, typically the particle loses one of its electrons.
A rigorous treatment of such electron-molecule/atom reactions is difficult but certain approximate methods work well.
Knowledge of the EICSs for components occurring in plasma is crucial for obtaining the energy balance in the plasma which is influenced by the ionization of plasma components by plasma electrons.
For example, the electron impact process can remove fast electrons and supply slow ones.
It also leads to an abundance of cationic species that can, possibly at other locations, re-neutralize or become multiply charged cations.
In our paper we describe the two most widely used methods for calculating the EICS, the Binary-Encounter-Bethe and the Deutsch-Maerk method.
Then we apply these methods to calculate the electron-impact cross sections of neutral and ionized Beryllium hydrides for the first time.
Finally, we present a way to obtain partial, reaction-specific cross sections as opposed to the overall ones.

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