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Electron Collisions with Dielectric Gases Considered as a SF_6 Replacement

JURAJ FEDOR, J. Heyrovsky Institute of Physical Chemistry, Czech Academy of Sciences

SF_6 is widely used as an insulator in high-voltage circuits and switchgear due to its excellent dielectric properties. However, it has an extremely high global warming potential. There is thus an intensive search for a suitable replacement, which has to be a strongly electron-attaching gas and, additionally, it has to fulfill several other criteria. We experimentally probe the electron collision processes with such candidate gases under single collision conditions. We focus on three elementary channels: (i) electron attachment, (ii) electron impact ionization and (iii) elastic and inelastic electron scattering. All channels are characterized quantitatively, that is, the absolute cross sections are measured using three different electron-molecule collision setups. Apart from providing the cross sections, we focus on the dynamics of atomic nuclei during the scattering, especially in the bond-breaking channels (dissociative ionization and dissociative electron attachment).