ELECTRON COLLISIONS WITH DIELECTRIC GASES CONSIDERED AS SF_6 REPLACEMENT

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Abstract. During the past decades, sulfur hexafluride (SF_6) has been globally used as an insulating medium in high-voltage power distributing circuits such as switchgears. It has a very high dielectric strength and ability to recombine itself in reactions driven by electric discharge, but on the other hand, it also has an alarmingly high global warming potential (GWP of 23.5k). Given the rising ecological awareness, there are big efforts to find a suitable replacement gas which at the same time is environmentally friendly and has good dielectric properties, among other criteria. Several candidates have been suggested already, but so far, a little is known about their fundamental physical and chemical properties, namely electron collision processes which govern their behavior under electric discharge.

We probe these insulating gas candidates with electrons in vacuum under single collision conditions, on three elementary channels: (i) electron attachment, (ii) electron impact ionization and (iii) elastic and inelastic electron scattering. By combining results from three electron-molecule collision setups, we are able to quantify all three channels and provide corresponding absolute cross sections for each process. In this talk, some of the experimental results will be presented with focus on the dynamics of atomic nuclei during the scattering, especially in the bond-breaking channels like dissociative ionization (Ranković et al. 2019), dissociative electron attachment and dissociation into neutral fragments (Ranković et al. 2020).

References

Ranković, M., Chalabala, J., Zawadzki, M., Kočišek, J., Slavíček, P., and Fedor, J. : 2019*, Phys. Chem. Chem. Phys.,* **21***,* 16451.

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