

Keep-in-Touch meeting (May 17, 2021, 2.00pm)

A few notes on the solution of the electron Boltzmann equation for swarms and the fitting of cross sections

Nuno Pinhão

IPFN, Campus Tecnológico e Nuclear/IST, Universidade de Lisboa

In this talk we discuss a few problems on the interpretation of electron swarm data and the fitting of electron collision cross sections.

1. The experiments to measure electron transport parameters have been interpreted using two different representations for the evdf: a) assuming space homogeneity and expanding the evdf in Legendre polynomial in v (frequently keeping just the two first terms); b) expanding the evdf in gradients of the electron density. These two representations lead to different expressions for the transport parameters and give rise to misinterpretations in the literature. It is important to identify the contact points and differences between both;
2. The electron transport parameters are usually measured at room or low temperature where only the ground vibrational level is populated. Polyatomic gases, however, have multiple vibrational modes and we find significant populations in the first vibrational states. However, this has not been considered in the published cross sections for several gases. We analyze the cases of C_2H_2 , C_2H_4 and C_2H_6 ;
3. The electron swarm is usually detected by a current signal. The interpretation of this signal, however, is not straightforward and we need to question “what property of the swarm is measured by the detector?”. We discuss this problem and how the raw experimental data can be corrected.

Finally, we discuss the use of analytical functions for the cross sections and the optimization of the step of the energy grid used to solve the Boltzmann equation.