GEC16-2016-000198

Abstract for an Invited Paper
for the GEC16 Meeting of
the American Physical Society

Challenge for more precise e- and ion-transport in gases and liquids[1]

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The full potential of technologies driven by non-equilibrium electron and ion processes in gases, liquids and soft-matter can only be realised once the basic physics has been mastered. The central component in this pursuit is an ever increasing need for the precise determination of electron and ion transport in such media. Over the last few decades, the group at James Cook University and collaborators have developed a suite of multi-term Boltzmann equation solutions to treat temporal and spatial non-locality for electrons and ions in electric and magnetic fields in gaseous systems. In this presentation, we will highlight recent developments including (i) a space-time multi-term solution of Boltzmann's equation; (ii) a unified treatment of electron and ion solutions of Boltzmann's equation which avoids mass ratio expansions; (iii) the treatment dense gases and liquids, including coherent scattering, screened potentials and (self) trapped bubble state effects, the latter of which can give rise to fractional transport behaviour, and (iv) the application to consider the self-consistency of cross-sections for electrons in biomolecules.

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