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5:00 PM, Tuesday, October 5, 2021
Room: GEC platform

Abstract: GT61.00029 : Electron transport and negative streamers in indium vapor*

← *Abstract* →

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We investigate the transport of electrons and propagation of negative ionization fronts in indium vapor. Electron swarm transport coefficients are calculated using a numerical multi term solution of Boltzmann's equation and a Monte Carlo simulation technique over a range of the reduced electric fields and the indium vapor temperatures. As many indium atoms are in the first $(5s^2 5p)\ ^2P_{3/2}$ metastable state at vapor temperatures of a few thousands of Kelvin, the presence of thermal motion of the host gas atoms and superelastic collisions are carefully considered and implemented in our codes. We observed a significant sensitivity of the spatial relaxation of the electrons under non-hydrodynamic conditions in the steady-state Townsend experiment, with respect to the indium vapor temperature and the initial conditions used to release electrons from the cathode. In order to simulate the inception and propagation of negative ionization fronts in indium vapor, we here apply the classical fluid model, which is based on the drift-diffusion approximation, the local field approximation and Poisson's equation. This model is implemented numerically in 1D and 1.5D configurations without photoionization. Among many important points, we found tthat he transition from an avalanche into a negative ionization front occurs faster with increasing indium vapor temperature, due to enhanced ionization and more efficient production of electrons at higher vapor temperatures.

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