

Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electron Shock Waves with a Significant Current behind the Shock Front¹ MOSTAFA HEMMATI, Arkansas Tech University — Electrical breakdown of a gas in a strong electric field is carried out by a wave with a strong discontinuity at the wave front, traveling with speed comparable to speed of light. For theoretical investigation of electrical breakdown of a gas, we apply a one-dimensional, steady profile, constant velocity, three component fluid model. For current bearing breakdown waves, in addition to the set of electron fluid dynamical equations, the shock conditions on electron velocity and temperature need to be modified as well. For breakdown waves, considering a significant current behind the shock front, we will derive the boundary conditions on electron velocity and temperature at the shock front. The modified set of boundary conditions has made the integration of the set of electron fluid dynamical equations through the dynamical transition region of the wave possible. The wave profile for electric field and electron velocity, temperature and number density will be presented.

¹The author would like to acknowledge the Arkansas Space Grant Consortium's financial support of this research project.

Mostafa Hemmati
Arkansas Tech University

Date submitted: 09 Dec 2011

Electronic form version 1.4