

A kinetic model of spark discharge breakdown

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Abstract—A zero-dimensional kinetic model of electrostatic spark discharges consisting of the time-dependent Boltzmann equation of electrons, electrical circuit equation and heavy particles' kinetic equations is being developed to understand initiation processes of ignition in flammable atmospheres, that is, how the electrostatic energy given transfers to the ignition energy via electron collisions with heavy particles. As a preliminary work, the breakdown of spark discharges in atmospheric air has been investigated to verify the model including its code being developed. The results of the breakdown with some initial electrostatic energies, in particular, the energy transfer phenomena are discussed.