Electron energy distribution control in gas discharge plasmas

V. A. Godyak

Electrical Engineering and Computer Science Department, University of Michigan, Ann Arbor, Michigan USA and RF Plasma Consulting, Brookline, Massachusetts, USA

The formation of the electron energy distribution function (EEDF) and electron temperature in low temperature gas discharge plasmas is analyzed in frames of local and non-local electron kinetics. It is shown, that contrary to the local case, typical for plasma in uniform electric field, there is the possibility for EEDF modification, at the condition of non-local electron kinetics in strongly non-uniform electric fields. Such conditions “naturally” occur in some self-organized steady state dc and rf discharge plasmas, and they suggest the variety of artificial methods for EEDF modification. EEDF modification and electron temperature control in non-equilibrium conditions occurring naturally and those stimulated by different kinds of plasma disturbances are illustrated with numerous experiments. The necessary conditions for EEDF modification in gas discharge plasmas are formulated.