

Time dependent self-consistent electron energy distribution functions during nano-second repetitively discharges in reacting N₂/H₂ mixtures

Gianpiero Colonna, PLASMI Lab. @ CNR-NANOTEC.

Electron energy distribution functions (eedf), vibrational and electronic excited states are self-consistently coupled for discussing the formation of ammonia under nano-second repetitively pulsed discharges. The Boltzmann equation for free electron is solved to determine the eedf, accounting for inelastic, superelastic collisions, affecting the heavy species kinetics. In particular superelastic collisions with electronically and vibrationally excited states of N₂ and H₂ molecules induce the strong non-equilibrium character of the eedf, reflecting on the rate coefficient of processes induced by electron collisions. This effect will be discussed to investigate the eedf of the mixture as a function of different applied reduced electric fields and of the inter-pulse delay time. The non-equilibrium character of the vibrational distributions of both N₂ and H₂ molecules and their role in affecting eedf will be discussed. Finally a comparison with existing numerical and experimental results will be presented.