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Numerical study of generation of active species in a streamer discharge[1] SHIRSHAK DHALI, Old Dominion University — Most practical atmospheric pressure discharges under ambient conditions transition from a Townsend to streamer-like discharge with time depending on the external voltage, gas composition and pressure, and the electrode geometry. Streamers are therefore critical in determining the reactive species population. We report results of numerical studies of steamers in different gas compositions at or near atmospheric pressures. The main effort of this work is to understand the production of reactive species and how it is influenced by the discharge physics. Three-dimensional Fluid models with azimuthal symmetry coupled with the Poisson's equation is used to simulate the streamer formation and propagation. Monte Carlo method is used to derive the transport properties from electron-impact cross sections for various gas mixture of technological importance. The results show that the tip of streamer is very efficient in the production of reactive species but the bulk of the fully formed streamer channels a significant amount of energy into gas heating. Overall a more uniform Townsend type discharge is more efficient for most species-type. However, for some high energy threshold species the streamer discharge is better. The G-factor (free radicals/100 eV) of several important species such as OH and O and its dependence on discharge parameters will be presented.

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