Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Spatio-temporal Characteristics of APD in He-Air Gas Mixture using Multi-dimensional Fluid Model MUHAMMAD IQBAL, MILES TURNER, NCPST, DCU — We present the characteristics of atmospheric pressure discharges (APDs) in He-air gas mixture with all meaningful chemical processes. The temporal profiles of conduction discharge current density are distinguished in the He-N_2 and He-air gas mixtures with the identification of weak and strong asymmetric breakdown mechanisms. The understanding of multi-dimensional features of bulk discharge plasma is elucidated in the breakdown phase by the spatial analysis of charge carriers (e^-, He^+, He_2^+, N_2^+, O_2^+, O^+, N^+, O_4^+, N_4^+). The behavior of electrons is elaborated in the passive phases, which provides the criterion for the minimum density of electrons before the evolution of next breakdown pulse. The temporal growth of different production rates shows that the charge transfer process is emerged as one of the dominant mechanism than the Penning ionization of impurities in He-air gas mixture. The considerable amount of O^- ions is persisted in the positive column than other negative ionic species (O_2^-, O_3^-, O_4^-, CO_3^- and CO_4^-), while the axial width of peak density increases from the light to heavy species near the anodic barrier. The validity of multi-dimensional fluid modelling simulation results of atmospheric pressure discharges are provided by the comparison of experimental results.

Muhammad Iqbal
NCPST, DCU

Date submitted: 11 Jun 2010 Electronic form version 1.4