Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Propagation of atmospheric-pressure surface plasmas on multi-layer silicon-based barriers DAVID PAI, THIBAULT DARNY, FREDERIC PAILLOUX, DAVID BABONNEAU, SOPHIE CAMELIO, CNRS Institut Pprime, University of Poitiers — Few studies of surface dielectric barrier discharges (SDBDs) have employed barriers not composed of bulk dielectric materials. We explore several forms of 'advanced' multi-layer barriers based on a class of material rarely used as propagating surfaces for SDBDs, namely semiconductors, using nanosecond pulsed discharges generated in air at atmospheric pressure. First, the deposition of an alumina film of 40 nm thickness on a silicon substrate enables the filamentary propagation of a surface discharge otherwise localized near the anode when bare silicon is used as a barrier. Second, we consider the case of a 1-micron thick layer of SiO_2 deposited on silicon, forming a Si-SiO_2 bilayer. Instead of filaments, the plasma propagates in a well-defined symmetric ring pattern. The ring pattern gradually expands on the surface during the positive voltage pulse and demonstrates high pulse-to-pulse reproducibility and stability. Third, the addition of a nanomaterial atop the Si-SiO_2 bilayer, namely ultrananocrystalline diamond (UNCD), enhances the propagation of the uniform ionization front. Scanning electron microscopy and Raman spectroscopy are employed ex situ to characterize how the plasma modifies the above surfaces.

David Pai
CNRS Institut Pprime, University of Poitiers

Date submitted: 30 May 2019 Electronic form version 1.4