Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Uniform propagation of cathode-directed surface ionization waves at atmospheric pressure[1] DAVID PAI, THIBAULT DARNY, THOMAS ORRIERE, SOPHIE CAMELIO, DAVID BABONNEAU, CNRS Institut Pprime, Universite de Poitiers — The uniform propagation of positive-polarity surface plasmas in air at atmospheric pressure has been achieved using a multi-layer structure, consisting of a silicon wafer covered by a 1-micron layer of SiO_2 as a propagation surface. Instead of the branched streamers typically observed on bulk dielectric surfaces, the plasma exhibits a homogenous ring-shaped structure with a high degree of reproducibility and stability. The plasma is generated by applying nanosecond positive voltage pulses to a tungsten wire touching the dielectric surface. The propagation of an ionization front with a region of high N_2^+* emission has been imaged in single shot operation at high spatial resolution with an ultraviolet reflective microscope coupled with a fast ICCD camera. We discuss the origin of the ring-shaped ionization wave, considering the role of the Si-SiO_2 interface and the effect of illumination by an external light source. The ring ionization wave may result from branching inhibition, due to a photoelectric effect at the interface created by the photons emitted by the plasma. To investigate the underlying mechanism, we compare ICCD imaging and electrical measurements for additional structures such as Si-Al_2O_3, Si-Si_3N_4, and Si-SiO_2-UNCD. We also demonstrate the generation of planar waves.

[1]Funding support: ANR JCJC PLASMAFACE (ANR-15-CE06-0007-01), LABEX INTERACTIFS (ANR-11-LABX-0017-01), CPER-FEDER program of the Region Nouvelle Aquitaine.

David Pai
CNRS Institut Pprime, Universite de Poitiers

Date submitted: 15 Jun 2020 Electronic form version 1.4