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Control of Ion Activation Energy to Surfaces in Atmospheric Pressure Plasmas Using Porous Dielectrics Films[1] NATALIA YU. BABAEVA, MARK J. KUSHNER, University of Michigan — The electric field in the avalanche front of high pressure filamentary discharges such as dielectric barrier discharges (DBDs) can be many 100s kV/cm. When the streamer strikes a surface, this electric field is transferred to a transient sheath at the surface. With mean free paths of < 1 μm, ion energies to surfaces produced by the sheath can exceed 10s eV. These energies can be controlled by having a layered dielectric substrate as the applied voltage is divided between the sheath, and these layered capacitances. However, if the surface being treated is, for example, human tissue, one cannot change the properties of the surface to control the ion energies. In this talk, we use results from a computational study to propose a method to control the transient sheath formed at the surface of bulk materials by atmospheric pressure DBDs to in turn control ion energies to the surface. A thin dielectric film having small holes through which the streamers can partially penetrate is placed on the surface. We show that ion energies can be controlled by the capacitance of the film and the size of the holes. Results are discussed for streamer penetration into the hole, sheath formation and the delivery of activation energy by ions and photons to the surfaces of polymers and human tissue.

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Mark Kushner
University of Michigan

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