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An Investigation of the Effect of Pressure Variations on Micro-Discharge Formation and Propagation in a 2-D Packed Bed Reactor[1]
KENNETH ENGELING, JULIUSZ KRUSZELNICKI, JOHN FOSTER, MARK KUSHNER, Univ of Michigan - Ann Arbor — Packed bed dielectric barrier discharge reactors (PBRs) are one of the technologies at the forefront of advanced plasma applications such as plasma-aided combustion, dry reforming of methane, and plasma catalysis. Plasma formation and propagation occurs through the porous media of the PBR in the form of microdischarges and are a function of several parameters. To investigate the kinetic mechanisms of the micro-plasma formation, a 2-dimensional packed bed reactor was designed for optical analysis. The 2-d array of dielectric aggregate with varying dielectric constants is used to simulate and visualize plasma formation as a function of voltage, pressure, gas type, and spacing to gain insight into actual packed bed discharge operation. In this work, we focus particularly on discharge evolution as a function of pressure from sub-atmospheric pressure to 1 Atm. The 2-d geometry is directly observed using fast camera imaging and emission spectroscopy. Microdischarges in the 2-D array are studied with both ns-pulsed discharge excitation as well as low frequency AC excitation.

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