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Atmospheric Pressure Plasma Treatment of Porous Dielectrics[1]
KSENIIA KONINA, JULIUSZ KRUSZELNICKI, MARK J. KUSHNER, Univ. of Michigan — Low temperature plasma catalysis is a potential technique to accelerate chemical processes. Many industrial dielectric catalysts or catalyst supports are porous for which penetration of plasma into the pores may be desirable. The shape of surface, including the pore opening, can restrict or enhance plasma penetration. For plasma to flow through the pore opening, the opening should be at least a few Debye lengths, which is about 10s of microns. Although plasma cannot directly flow through smaller openings, the plasma may generate a flux of photons that does penetrate inside the pore and which produces photoionization to seed a plasma. Even if a pore does not fill with plasma, the sub-surface pore can affect propagation of plasma across the surface due to the change in surface capacitance. In this paper we discuss results form a computational investigation of atmospheric pressure plasma propagation into the pores of a catalyst-like material having different shapes and small openings. The 2-D plasma-hydrodynamics model *nonPDPSIM* was used in our study. Simulations were performed for surface ionization wave (SIW) treatment of the porous surface in humid air at atmospheric pressure. The likelihood of SIW propagation into the pore was found to depend on the pore diameter, spacing, topology (concave inwards or outwards) and pore opening. The influence of air pores under a flat surface on SIW propagation was also investigated.

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