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Simulation of High Pressure Ionization Waves in Straight and Circuitous Dielectric Channels[1] ZHONGMIN XIONG, U. Michigan, KEISUKE TAKASHIMA, IGOR V. ADAMOVICH, Ohio State U., MARK J. KUSHNER, U. Michigan — High pressure non-equilibrium plasmas are often transient and in the form of fast ionization waves (FIWs) with applications from plasma assisted combustion to plasma medicine. A numerical study of FIWs, with comparison to experiments, was conducted using nonPDPSIM, a 2-d plasma hydrodynamics model with radiation transport. We first investigated the fundamental properties of moderate pressure FIWs in straight dielectric channels to quantify their propagation mechanisms. The FIWs were generated by ns high voltage pulses in N_2 and He at pressures of 10-20 Torr. Simulations are compared to experiments for transient electric fields and wave speed. The effects of the secondary emission properties of bounding surfaces on plasma uniformity will be discussed. We then applied these results to a study of the propagation of FIWs in Ne at atmospheric pressure through long, circuitous channels (length > 15 cm, width < 1 mm) as used to deliver plasma to remote sites. The FIW speed and front structure for positive and negative polarities, and the effects of channel curvature and dielectric constants of the channel wall on FIW dynamics will be discussed.

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