Abstract Submitted
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Chemical Kinetics Mechanisms Study of High Electron Density Argon-Water Filamentary Discharges*[1] YUCHEN LUO, University of Minnesota, AMANDA LIETZ, MARK KUSHNER, University of Michigan, PETER BRUGGEMAN, University of Minnesota — Although the plasma kinetics of He-H_2O mixtures has been investigated for diffuse low electron density atmospheric pressure glow discharges, the kinetics of high electron density filamentary discharges is less well known. In this work, we study the kinetics of a filamentary nanosecond pulsed Ar+0.26% H_2O plasma using a 0D chemical kinetics model with comparison to previously measured OH and H densities by time resolved laser induced fluorescence (LIF) and two-photon absorption LIF [1]. Good agreement is obtained for absolute values of the H and OH densities. There are, however, discrepancies between the model and the experiment and the origin of these discrepancies will be discussed. Results from the model indicate that the production of H/OH involve electron dissociative recombination reactions with water ions and its clusters. H and OH consumption in the afterglow are due to radical-radical recombination. The significantly lower density of OH compared to the H density is due to electron induced dissociation of OH during the discharge pulse and enhanced recombination by the large O density in the afterglow. Effects of air impurities, local depletion of water at the filament position and transport on the OH kinetics will also be discussed. [1] Yatom et al. (submitted)

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