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Chemical kinetics of radio-frequency driven atmospheric-pressure helium-oxygen plasmas in humid air TOMOYUKI MURAKAMI, Tokyo Institute of Technology, KARI NIEMI, Queens University Belfast, TIMO GANS, DEBORAH O'CONNELL, University of York, WILLIAM GRAHAM, Queens University Belfast — We describe the chemical kinetics of radio-frequency (rf) driven atmospheric-pressure helium-based plasmas in ambient air as determined through a zero-dimensional time-dependent global model. The effects of humid-air admixtures on the plasma-induced chemical reactions and the evolution of species concentrations in the helium-oxygen mixture (He-O2, helium with 5000 ppm admixture of oxygen) are studied for wide air impurity levels of 1-5000 ppm with the relative humidity of 0-100%. Comparisons made with experiments using an rf driven micro-scale atmospheric pressure plasma jet and one-dimensional simulations suggest that the plausible air impurity level in the experiments is not more than hundreds ppm. Effects of the air impurity containing water-humidity on electro-negativity and chemical activity are clarified with particular emphasis on reactive oxygen species.

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