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Control of ROS and RNS in air surface micro-discharge for antisepsis and sterilization YUKINORI SAKIYAMA, University of California, Berkeley, TETSUJI SHIMIZU, Max Planck Institute for Extraterrestrial Physics, DAVID GRAVES, University of California, Berkeley, GREGOR MORFILL, Max Planck Institute for Extraterrestrial Physics — Ambient gas plasma is a promising technology in various areas of medicine. We have developed a plasma antisepsis and sterilization device based on a surface micro-discharge in air at atmospheric pressure. ROS (reactive oxygen species) and RNS (reactive nitrogen species) are thought to play crucial roles in sterilization. The ultimate goal of this project is to develop numerical models for a better understanding of plasma-biomaterial interaction and for optimization of the device efficiency. Here, we focus on the modeling of plasma chemistry of the plasma sterilization device in humid air. Our model is based on a zero-dimensional plasma fluid model with the local field approximation. The model includes 48 species and 630 reactions. Electron density and electric field are given as input parameters from our experiments. Surface reactions are included. Initial simulation results indicate many reactive species are generated in discharge region, including O2*, H2O2, N2O, NO2, NO, O, OH, NO, and HO2. In the presentation, our simulation results will be compared with experimental measurements. We will also propose methods to control the ROS and RNS to optimize the device efficiency.

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