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Modeling of radical productions and subsequent decay processes in an atmospheric pressure streamer discharge ATSUSHI KOMURO, RYO ONO, TETSUJI ODA, The University of Tokyo — A streamer discharge has been considered to be an effective production source of chemically active radicals. However, theoretical understanding of the discharge phenomenon and the chemical kinetics is still poor. This study is devoted to reveal the radical behaviors in an atmospheric pressure streamer discharge in $H_2O/O_2/N_2$ gas mixtures. The present model includes a discharge model, a gas dynamics model and chemical kinetics model with vibrationally excited molecules. It is shown that the numerically obtained axial distributions of O, N and OH radical are consistent with our experimental results. Direct dissociation processes, two-step dissociation with vibrationally excited molecules and a quenching of excited O atoms are predominant for O, N and OH radical productions, respectively. In addition, a gas temperature and decay rates of radicals in post-discharge periods are also compared with our experimental results. Numerically simulated gas temperatures in post-discharge phase increase as humidity increase. This tendency has already shown in our previous experimental results and it is successfully reproduced in our model. It is also shown that the rise in gas temperature affects subsequent radical decay processes.

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