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Effect of vibrationally excited molecules on the production of O radicals in a pulsed streamer discharge ATSUSHI KOMURO, RYO ONO, TETSUJI ODA, The University of Tokyo — Streamer discharge is widely used in many applications. However, the understanding of its phenomena is still poor. The complete simulation of the streamer discharge can lead to a better understanding of the physical-chemical activity and help us to choose the best operating conditions. The vibrationally excited molecules have large influence on the discharge phenomenon. In atmospheric pressure plasma, the vibrationally excited molecules affect the dissociative attachment ($e + O_2 \rightarrow O + O^-$) because the survival probability of intermediate negative ions (e.g. O_2^{-*}) between auto-ionization and dissociation strongly depends on vibrational state. Atomic oxygen is one of the important radicals in plasma. We previously measured the O radical density and showed that O radicals are mainly produced in the secondary streamer channels, not in the primary streamer channels. However, it has not been numerically reproduced yet because the vibrational kinetics in atmospheric pressure plasma has not been sufficiently considered. In this research, we developed two-dimensional numerical modeling of the cathode directed streamer in air including vibrational kinetics. The obtained results showed that vibrationally excited molecules have large influence on the production rate of O radicals in the streamer discharge.

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