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Numerical analysis of chemical reactions in a single droplet in atmospheric-pressure nonequilibrium plasma GO YOKOTA, YUSUKE NAKAGAWA, IPPEI YAGI, SATOSHI UCHIDA, FUMIYOSHI TOCHIKUBO, Tokyo Metropolitan University — Plasma-induced liquid-phase reactions primary occur at the plasma-liquid interface by the incident species in the plasma. The use of microdroplet is advantageous to enhance plasma-liquid interaction due to their large specific surface. Because the electron and ion fluxes onto the droplet surface depend on the local electric field, the droplet charging and the reactions in the droplet can have a spatial distribution. In this study, we modeled the plasma-droplet interaction for a single droplet in a homogeneous atmospheric pressure He plasma by continuity equations for charged/neutral species coupled with Poisson's equation. The droplet is a silane solution with a radius of 4 m and the analysis time is about 10 ms. The simulation results show that the charge of the droplets in the plasma is not uniform but angular dependency. The flux from the plasma to the droplet is approximately constant after the surface charging of the droplet has reached steady state. The chemically active region in the droplet is in a thin layer near the interface. Most of the products inside the droplet is started to be formed near the interface due to chemical reactions, and then they diffuse into the interior of the droplet.This work was supported by JSPS KAKENHI Grant Number JP18H01207.

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