Abstract Submitted
for the GEC17 Meeting of
The American Physical Society

Plasma chemistry model of microdischarge in flowing humid air directly heated by discharge[1] CHANGHO YI, SUNG-YOUNG YOON, SANGHEUM EOM, SEUNGIL PARK, SEONG BONG KIM[2], SEUNGMIN RYU, SUK JAE YOO, Plasma Technology Research Center, National Fusion Research Institute — We present a numerical model of microdischarge in humid air of atmospheric pressure considering the effects of direct ohmic heating of discharge layer and heat and particle transport by flow. The model consists of three coupled well-mixed regions of hot discharge layer, warm afterglow layer, and cold large volume layer, which interact with each other through thermal conduction, diffusion, and particle flow. The calculated results and experimental results of Fourier transformed infrared absorption spectroscopy shows reasonable agreements for dynamics of various reactive oxygen and nitrogen species, and showed large discrepancy when ohmic heating in discharge layer was ignored. These results indicate that localized ohmic heating by microdischarge substantially affected on the chemical reactions with temperature dependence. Heat and particle transport by flow also affected on dynamics of reactive neutral species in various gas flow configurations. Hence, the deposition and transfer of both heat and species should be considered together to properly calculate the dynamics of reactive neutral species in microdischarges.

[1]This study was supported by Research and Development Program of Plasma Advanced Technology for Agriculture and Food (Plasma Farming) through the National Fusion Research Institute of Korea (NFRI) funded by the Government funds.
[2]Corresponding author (sbkim@nfri.re.kr)

Changho Yi
Plasma Technology Research Center, National Fusion Research Institute

Date submitted: 02 Jun 2017 Electronic form version 1.4