Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Water ion thrusters using micro ECR discharges for CubeSat projects YOSHINORI TAKAO, KENGO NAKAMURA, YOSUKE SATO, Yokohama National University, HIROYUKI KOIZUMI, The University of Tokyo — The use of CubeSats has dramatically been increased since 2013 because of the low cost and shot development period. Since the limitation of the size, weight, and power, only a few CubeSats have propulsion system for their missions, where their propulsion performance is still very low. Ion thrusters are one of the high-performance propulsion systems and a promising candidate for CubeSat missions requiring high Δv (change in velocity) if the gas storage and feeding system is significantly miniaturized. Here, an ion thruster using water as the propellant has been proposed for 10-kg class CubeSats and its discharge characteristics have been investigated by three-dimensional particle-in-cell simulation with Monte Carlo collisions (PIC-MCC) and the direct simulation Monte Carlo (DSMC) method. The plasma source employs 4.2-GHz microwaves for the discharge and the size of the discharge chamber is 20 x 20 x 4 mm^3. Many reactions, such as ionization, rotational and vibrational excitation, attachment, detachment, charge transfer, etc., are incorporated in the MCC process. The simulation results have indicated that H_2O^+ and OH^+ are the major components of ion species in the discharge, which is a favorable result since these species dominantly contribute to the thrust.

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Date submitted: 21 Jun 2018 Electronic form version 1.4