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Experimental studies of a Microdischarge Plasma Thruster in a Tri-Electrode Configuration.[1] UTSAV KC, JOHN BINGAMAN, PHILIP VARGHESE, LAXMINARAYAN RAJA, University of Texas at Austin — We present results from investigation of a direct-current microdischarge based miniaturized plasma thruster called Micro Plasma Thruster (MPT). The MPT consists of three molybdenum electrodes separated by interlayer dielectrics, and uses argon at ∼1 sccm as propellant. The discharge is generated in the hollow fabricated to run through the MPT. The hollow in the upstream part comprising the first two electrodes is sufficiently small (about 100 μm dia.) that a pilot microdischarge can be generated. The hollow from the second to third electrode is larger (about 300 μm dia.) to allow for expansion of the gas to lower pressure so that an intense secondary discharge, which is stabilized by the pilot discharge, is created in this region. Thrust is generated by the expulsion of ions and neutral species. The MPT is operated with modest voltage ($<$ 1 kV) and low power ($\sim$ 1 W). We demonstrate conditions under which a stable microdischarge can be sustained. The voltage-current characteristics from the MPT provide insights into discharge operations. Optical imaging, and spatially resolved optical emission spectroscopy in the plume region are used to characterize the composition of the plume. We also perform electrical probe measurements in the plume to characterize its ion distribution.

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