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Experimental Studies of a Direct-Current Microdischarge Plasma Thruster STEPHEN A. YELDELL[1], LAXMINARAYAN L. RAJA[2], PHILIP L. VARGHESE[3], The University of Texas at Austin — Recently we proposed a novel Microdischarge Plasma Thruster (MPT) using direct-current microdischarges. The MPT uses a dc-microdischarge to provide intense and controllable heating of a propellant gas stream, before it is expanded into vacuum through a sub-millimeter nozzle. This paper reports experimental results for an MPT operated with inert gas (He and Ar) propellants. Characteristic dimensions of the discharge and the nozzle are about 300 μm. We report electrical characteristics of the MPT under different geometric and operating conditions. We have also performed optical imaging and emission spectroscopy of the MPT plume expanding into a vacuum. Results indicate that a stable microdischarge can be established in the MPT configuration, with bulk gas flow, at breakdown voltages as low as 150 V for upstream reservoir (stagnation) pressures ranging from 100 to 500 Torr. Optical images show a well collimated luminous plume that extends a few centimeters from the nozzle exit plane. Emission spectroscopy was used to make line-integrated relative intensity measurements of several transitions in helium between 380 and 590nm immediately downstream of the nozzle exit plane in the plume. Boltzmann plots based on emission intensity suggest electronic excitation temperatures of $\sim$0.3 eV.

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