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Simulation studies of Micro Cavity Discharges for Microthruster Applications HARISWARAN SITARAMAN, LAXMINARAYAN. L. RAJA, University of Texas at Austin — Direct-current (DC) microdischarges have been proposed for several applications such as in photonics and materials/chemical processing. They are well suited for integration within micro propulsion devices for small satellite thrusters. However, one important limitation in these devices is the rapid erosion of exposed electrodes due to sputtering and ion bombardment heating. An alternative approach is to use dielectric-covered electrodes with alternating current to drive the discharge. The Micro Cavity Discharge (MCD) thruster adopts this approach and consists of a channel section with dielectric covered electrodes where the plasma power deposition takes place and a divergent nozzle through which the gas expands to near vacuum conditions in space. The system now resembles a Micrometer scale Dielectric-Barrier Discharge (Micro DBD) which operates in a pulsed mode and is accompanied with high gas heating. Multi-dimensional computational plasma and flow modeling studies of these devices are presented. We present details of discharge dynamics, power coupling mechanisms, flow-plasma coupling effects and thruster performance. Results indicate that large gas heating is possible with high-frequency $\sim$10's MHz, rather than the typical excitation frequency of $\sim$ kHz used in classical DBDs.

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