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Rocket Propulsion Through Multiply Charged Ions From a Mirror Plasma,* L. Leung, *University of California-Berkeley,* C.C. Petty, T.E. Evans, *General Atomics* – Plasma propulsion is of interest for space exploration because the high exit velocity of the propellant, compared to that of chemical means, generates a high final spacecraft velocity with reduced propellant mass. This project evaluates the viability of using plasma in a magnetic mirror to produce multiply charged ions as propellant. Electron cyclotron heating of a mirror plasma produces deeply trapped hot electrons which strip heavy ions of electrons. The ambipolar potential accelerates the greatly charged ions to high velocity as they exit the end of the magnetic mirror open to space, generating thrust. We model the distribution of ion charge states to include all relevant atomic processes using the conservation of particle and energy equations in tandem with cross-sections from the ADAS database. The system of equations is then optimized to determine the feasibility of plasma propulsion. The results of this model in a high-density rocket regime are benchmarked against experimental data in low-density mirror plasmas.

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