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Physical Differences Between Xenon and Krypton Operation on a Magnetically-Shielded Hall Thruster[1] LEANNE SU, BENJAMIN JORNS, University of Michigan — Hall Effect thrusters (HETs) are an electric propulsion device with high thrust, moderate specific impulse, and decades of in-space flight heritage. Magnetic shielding has extended lifetimes on HETs, enabling longer missions which necessitate higher propellant throughputs. The cost of traditional propellant for HETs, Xe, is prohibitively high. Krypton offers a cheaper alternative at lower thrust and higher specific impulse. It is necessary to understand how and why the performance of magnetically-shielded (MS) HETs changes between these species at the same power. A 9-kW MS HET was operated in a vacuum facility on Xe and Kr. The anode efficiencies and phenomenological efficiencies were measured with a thrust stand and a probe suite. The results indicate that Kr performs worse than Xe on a shielded thruster by a larger margin than seen on unshielded ones. This disparity is attributed to decreases in the mass and current utilization efficiencies for Kr. Potential theories for this include a change in the radial electron temperature channel profile and increased electron mobility. Simulations of a MS HET on Kr are used to substantiate these theories. The results of this study illuminate trends in Xe and Kr efficiencies on a MS HET and explore their underlying physical differences.

[1]NSF GRFP

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