

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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DEVELOPMENT OF A LAB6 CATHODE FOR HIGH-POWER HALL THRUSTERS

Abstract

High-power Hall effect thrusters represent attractive propulsion systems to perform thrust-intensive and deep-space missions. For this class of thrusters the cathodes must be able to sustain operating currents up to several tens of amperes. To this purpose, a lanthanum hexaboride (LaB6) cathode for a 5-kW Hall effect thruster has been developed and tested in Alta. The boride compound has been selected for the longer expected lifetime at the required discharge current, despite the higher work function as compared to the traditional dispenser emitters. In addition, a LaB6 cathode relaxes the gas purity requirements due to a reduced sensitivity to contaminants and does not require a lengthy conditioning process to initiate the electron emission. The cathode design features a graphite tube to avoid the issues linked to the reactivity of LaB6 with refractory metals at high temperature. Graphite was also selected for the keeper to limit the effect of sputtering by ion bombardment on this electrode. The experimental results will be presented and compared with the predictions from a previously developed model describing the operation of thermionic hollow cathodes, showing a good agreement between empirical and theoretical data.