

## **Model of the Plasma Potential Distribution the Near the Discharge Cathode in an Ion Thruster**

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In most gridded electrostatic thrusters, a single, centrally located hollow cathode supplies the electrons used to produce ions by electron bombardment in the discharge chamber. In recent engine tests several cases of discharge cathode orifice plate and keeper erosion have been reported. In this paper we present results from a new model of the plasma potentials in the magnetic channel just downstream of the hollow cathode orifice. The model takes account of the sonic transition in electron flow velocity as the hollow cathode plasma and neutral gas expand into the discharge chamber. This transition sets up a double layer potential structure that is the source of discharge chamber primary electrons. Ions are accelerated upstream through the double layer. The locations and potential magnitudes of the double layers are calculated using a previously reported 1-D model modified to account for primary electrons downstream of the double layer and accelerated ions upstream of the double layer. It is shown that the primary electrons carry most of the discharge current and cause most of the ionization in the discharge chamber. However, the magnitude of the double layer also effects sputter erosion of discharge cathode and keeper surfaces.