

## Ion Thruster Grid Lifetime Assessment Based on Its Structural Failure

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**Abstract :** This article developed an ion thruster optic system sputter erosion depth numerical 3D model by IFE-PIC (Immersed Finite Element-Particle-in-Cell) and Mont Carlo method, and calculated the downstream surface sputter erosion rate of accelerator grid; Compared with LIPS-200 life test data, the results of the numerical model are in reasonable agreement with the measured data. Finally, we predict the lifetime of the 20cm diameter ion thruster via the erosion data obtained with the model. The ultimate result demonstrates that under normal operating condition, the erosion rate of the grooves wears on the downstream surface of the accelerator grid is  $34.6\mu\text{m}/1000\text{h}$ , which means the conservative lifetime until structural failure occurring on the accelerator grid is 11500 hours.

**Keywords :** ion thruster, accelerator grid, sputter erosion, lifetime assessment

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