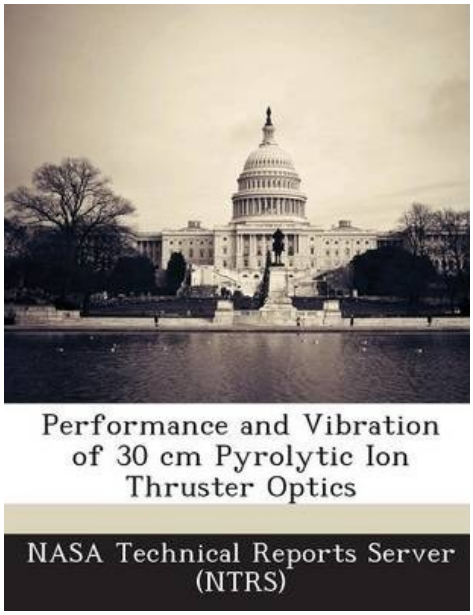

Performance and Vibration of 30 CM Pyrolytic Ion Thruster Optics

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Carbon has a sputter erosion rate about an order of magnitude less than that of molybdenum, over the voltages typically used in ion thruster applications. To explore its design potential, 30 cm pyrolytic carbon ion thruster optics have been fabricated geometrically similar to the molybdenum ion optics used on NSTAR. They were then installed on an NSTAR Engineering Model thruster, and experimentally evaluated over much of the original operating envelope. Ion beam currents ranged from 0.51 to 1.76 Angstroms, at total voltages up to 1280 V. The perveance, electron back-streaming limit, and screen-grid transparency were plotted for these operating points, and compared with previous data obtained with molybdenum. While thruster performance with pyrolytic carbon was quite similar to that with molybdenum, behavior variations can reasonably be explained by slight geometric differences. Following all performance measurements, the pyrolytic carbon ion optics assembly was subjected to an abbreviated vibration test. The thruster endured 9.2 g(sub rms) of random vibration along the thrust axis, similar to DS 1 acceptance levels. Despite significant grid clashing, there was no observable damage to the ion optics assembly.