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ELECTRODELESS PLASMA THRUSTERS FOR REDUCED WEAR AND ENHANCED LONGEVITY

Abstract

This project is designed to develop the first demonstrated prototype of a long-duration deep-space capable electrodeless plasma thruster, incorporating magnetic field generation to produce plasma, and eliminate degradation of system components by electrodes; electrodes degraded by interaction with high-energy ions in the plasma. The project will be modeled using COMSOL's plasma physics module to address the configurations and behavior of magnetic fields and plasmas, thus being able to optimize magnetic field strengths and geometries so that stable generation of plasma acceleration, in particular, can take place without physical contact.

Fusion 360 will be used to model the magnetic assembly for integration with the propulsion system in space. With the capabilities in the particle-in-cell simulation using MATLAB, exhaust velocities and thrust efficiency will be analyzed across a range of magnetic field strengths with a maximum in specific impulse and minimum power consumption in mind. Such thruster designs are suited well for missions that will last years-Deep Space and Interplanetary missions are very appropriate. This removes reliance on electrodes-one of the major contributions to degradation as time moves along. A major limiting factor that exists for plasma propulsion systems at the moment, this system removes the likelihood of degradation through this break-up. So, within this project, innovation has been in extending the lifespan of a plasma thruster and providing a propulsion system that has efficiency and lifespan combined for the rigors of extended space travel.