



## System for Generating Electron Beams from a Radio-Frequency Plasma

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an “electrode-less” electron beam system that produces electron flow from a plasma.**

### Overview

Electron beam sources are used commercially in a wide variety of ways, including the curing of ink and polymeric coatings; deposition of thin metallic films on packaging; execution of plasma-assisted chemical vapor deposition; and neutralization of positive ion beams. As charge neutralizers, electron beams play an especially important role in the operation of ion beams that act as thrusters on satellites and other spacecraft. Many industrial applications employ hollow cathodes to generate beams of electrons. This technique’s main drawback is that the process of producing electrons consumes the cathode, limiting its lifespan to three or four years. Hollow cathodes also tend to be difficult to ignite.

### The Invention

To address these issues, UW-Madison researchers have devised an “electrode-less” electron beam system that produces electron flow from a plasma generated with radio-frequency (RF) fields in the presence of a magnetic field. The current extracted by this system exceeds that normally produced with conventional RF electron beam sources, because electrons are extracted through an “electron sheath.” In addition, the system does not consume electrode material, making long-term operation dependent only on the availability of operating gas.

### Applications

- Ion thruster systems on spacecraft
- Curing of ink and polymeric films
- Deposition of thin metallic films

### Key Benefits

- Provides a reliable, efficient and *long-lived* electron beam source for a wide range of industrial applications
- Promises to extend the operational lifetimes of ion thruster systems on satellites and other spacecraft while also reducing fuel consumption

### Additional Information

#### Related Intellectual Property

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#### Tech Fields

- [Materials & Chemicals : Other materials & chemicals](#)

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