Plasma Processing of Waste and Biofuels

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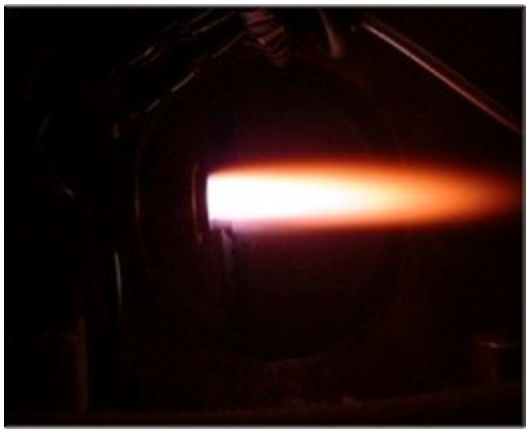

Abstract:

Many different types of plasma accelerators have been developed as methods of electronic propulsion in space. One of these technologies is now looking to be used back on Earth to process waste products in gassification plants. The technical capabilites and expertise gained while developing the thrusters for space will prove very useful for anyone wishing to adapt this for terrestrial use.

Description:

Many plasma accelerators have been developed over the years as electric thrusters for space applications. These include arc jets, gridded ion engines, magnetoplasmadynamic (MPD) thrusters, pulsed plasma thrusters, Hall Effects Thrusters (HETs) and gridded ion engines (GIEs). In all of these devices, the goal has been to develop a device, which has long lifetime and high efficiency/performance. In practice tens of thousand of hours of operation with no repair or maintenance is required in order to achieve the mission requirements and high efficiency (the ratio of the output power in the jet to the electric input power) is paramount to minimize the electric power needed and mass.

During the development of the so called electromagnetic or plasma type of thrusters, several generic problems have arisen, the key ones being electrode (and other surfaces) erosion and plasma stability which limit both lifetime and performance (indeed even the non-plasma thrusters i.e. GIEs suffer from electrode erosion as the life limiting mechanism, though the fundamental mechanisms are different because there is no current attachment at the electrodes).

To overcome these problems there has been a great deal of research and development which has not only led to the development of improved devices but to a much better understanding of the

fundamental physics of the technological barriers e.g. stability of the current attachment at the anode or positive electrode in MPDs.

Recently, there has been much interest in the use of plasma processing of waste and also as a method of 'burning' biofuels. Although there are differences in the technologies of the plasma devices (usually called plasma torches) used for the processing of waste or biofuels (primarily in that of pressure with the terrestrial devices operating at high pressure of 1 atmosphere and above and those for space at lower pressures), there are many similarities not just in the physics but the technological challenges such as longer life electrodes and high efficiency. The former results in shorter down periods and hence lower costs and the latter leading to decreased electricity to run the plasma device and hence again improved economics.

Innovations and advantages of the offer:

- Much research has been conducted to improve the devices and the understanding of the fundamental physics behind them.
- High efficiency
- Longer life electrodes.
- Flexibility in the design and tailoring of new devices.

Further Information:

N/A

Application:

- Plasma processing of waste
- 'Burning' of biofuels.

Work needs to be done to determine the correct plasma chemistry, flow and stability along with electrode lifetime.

Space Heritage:

This technology was developed for electric propulsion while in space aboard various satellites.

Broker comments:

This technology is still very much in the development phase but the expertise of plasma chemistry within the team is strong and would be useful to any company looking to exploit this.