Plasma Processes, Inc.

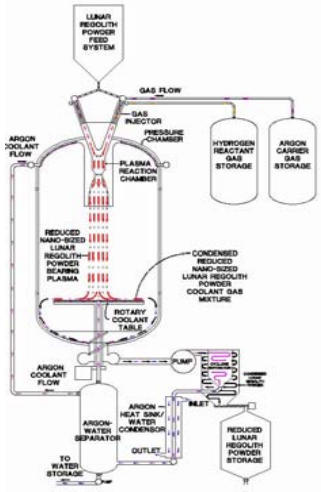
NASA SBIR/STTR Technologies
Hydrogen Plasma Reduction of Lunar Regolith for In-Space Fabrication

SBIR STTR

PI: Scott O'Dell/Plasma Processes, Inc.-Huntsville, AL, Proposal No: 05-1-X9.01-8468

Identification and Significance of Innovation

- Raw materials (Metals & H_2O) are needed for in-space fabrication and support of space missions.
- An innovative hydrogen plasma reduction technique for production of nanosize metal powders and water from lunar regolith simulant will be developed.
- High temperature, highly reactive ionized H_2 and rapid quenching enable the production of nano-size raw materials for in-space fabrication such as Si, Ti, Al, Fe and O_2 (H_2O) for life-support and fuel.



(L) An example of hydrogen plasma reduced powder, i.e., nano-meter size tungsten produced from micron size tungsten oxide feedstock.

(L) Schematic showing preliminary design of an integrated plasma unit for hydrogen plasma reduction of regolith simulant.

Technical Objectives and Work Plan

- Modify existing plasma reactor to enable vaporization of regolith simulant by Ar/H_2 plasma.
- Highly reactive H_2 will react with the vaporized simulant, while rapid quenching provides nucleation of nano-size metal powders.
- Characterization of metal powders will determine particle size, composition and phases.
- Moisture analyzer and condensation apparatus will be used to measure and collect evolved water.

NASA and Non-NASA Applications

- Feedstock for in-space fabrication: Si - solar cells; Al, Ti, Fe - structural use; O_2 (H_2O) for life-support, habitat and propulsion use.
- Powder metallurgy products, protective coatings, catalysts, composite additives, sintering aids, microfiltration membranes, rocket fuel additives, rocket motors, electronics, solid waste incineration

Firm Contacts

PI: Scott O'Dell, scottodell@plasmapros.com

Bus: Angela Hattaway, ahattaway@plasmapros.com