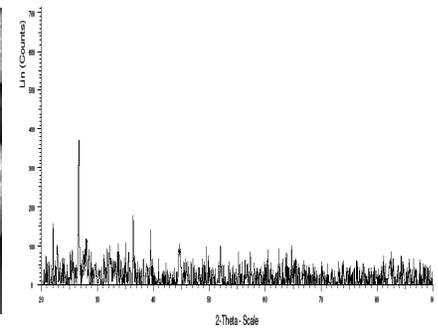
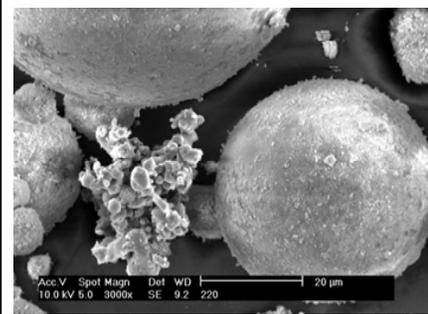


Identification and Significance of Innovation

- Raw materials (e.g., metals and O₂) are needed for in-space fabrication, life support, and fuel use.
- An innovative plasma reduction technique has been used to produce Si, Fe, & Mg metals and gases from JSC-1 lunar regolith simulant during Phase 1.
- During Phase 2, plasma reduction techniques will be optimized to produce pure O₂ and other metals such as Al, Ti and Ca from regolith simulant.
- The development of these technologies are vital for long-term Lunar and Marian exploration.



Plasma reduced JSC-1 showing agglomerate and volcanic glassy analog particles. XRD results confirm presence of metallic Fe. XRD of processed JSC-1 at left. Powder contains Fe (bcc), Mg, SiO₂, & C plus amorphous components not visible using XRD.

Technical Objectives and Work Plan

- Collect O₂ gas from plasma reduced processing stream.
- Produce & quantify/characterize additional metals (Ti, Al, & Ca) from plasma processing.
- Measure, record, and optimize plasma processing parameters using real-time temperature and velocity data along with theoretical calculations to evolve O₂ and metals.
- Minimize power requirements and perform low pressure processing to simulate lunar environment.
- Design 1/5 scale system for robotic mission demonstration.
- Evaluate the production of agglomerate and glassy phases for additions to lunar simulants for dust, abrasion, tool wear and mining research.

NASA and Non-NASA Applications

- Feedstock for in-space fabrication: Si - solar cells; Al, Ti, Fe - structural use; O₂ (H₂O) for life-support, habitat and propulsion use, mature lunar simulant for dust, abrasion, mining & excavation research.
- Powder metallurgy products, protective coatings, catalysts, composite additives, sintering aids, microfiltration membranes, rocket fuel additives, rocket motors, electronics, fuel cell technologies

Firm Contacts

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