NASA SBIR/STTR Technologies

Improved Lunar and Martian Regolith for Research, Outreach, and Implementation

PI: Tom Crabb, Orbital Technologies Corporation, Madison, WI
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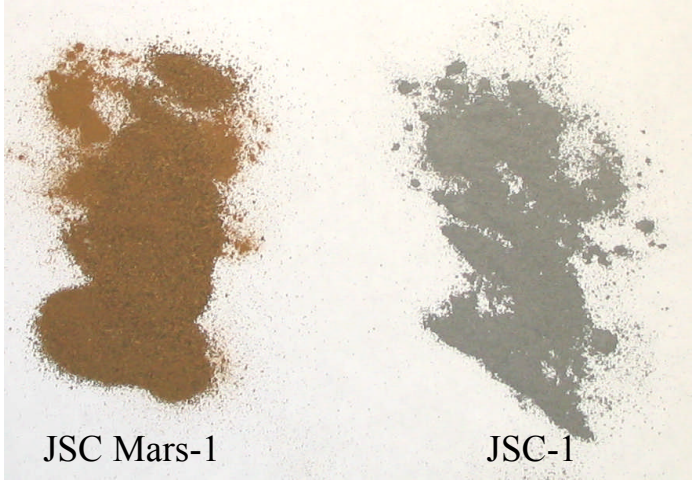
Identification and Significance of Innovation

This SBIR will conduct feasibility studies on new lunar and Martian simulants with improved composition and mineralogical analysis. For lunar regolith, Orbital Technologies Corporation (ORBITEC) proposes to recreate the JSC-1 material and study post-production processes to add additional glass to improve composition. The feasibility of creating a lunar highlands-type simulant will also be studied. For Martian regolith, ORBITEC will update the mining process of the JSC Mars-1 simulant with improved extraction to avoid contamination that resulted in non-Martian components. Additional grain size particles will also be prepared to improve its grain size distribution comparison.



Technical Objectives

- Outline processes for the addition of glass spheriles into small quantities of lunar simulant (i.e. 1 kg amounts) to improve material composition.
- Determine the feasibility of adding lunar highlands material into small quantities of simulant to improve material composition.
- Outline process to improve contamination of magnetite in Martian simulant.
- Outline process to produce several grain sizes to achieve a more representative sample grain size distribution in Martian simulant.
- Determine feasibility of future mining at each proposed mining site.

Work Plan

1. Define requirements for each simulant's composition.
2. Define new production processes to meet the technical requirements.
3. Conduct environmental assessments of proposed mining sites
4. Assess feasibility of future mining and processing
5. Define the post-mining simulant testing plan

NASA Applications

Materials science and technology research is crucial for safe human travel and work on future lunar or Martian long-duration missions. NASA needs techniques and processes for in-space fabrication of critical path components for the exploration of space. To conduct this research, NASA must have lunar and Martian regolith simulant for materials experiments and prototype testing of transportation equipment, advanced life support systems, and in-situ resource processing. The demand for these simulants is increasing daily.

Non-NASA Applications

The past lunar and Martian regolith simulants held tremendous appeal for education and outreach. Educational supply companies purchased the material for educator kits and teacher workshops, and companies have already expressed interest in new simulant for classroom plant growth kit and souvenir items as well.

Firm Contacts

Thomas Crabb, crabbt@orbitec.com, 608-827-5000

Marty Gustafson, gustafsonm@orbitec.com, 608-827-5000