National Aeronautics and Space Administration

Space Technology Mission Directorate
Game Changing Development Program

Lunar Oxygen/Water Extraction – Lunar Simulants (LOWE-LS)

Project Overview

For FY22, the emphasis for lunar simulants was on interaction with other GCD and NASA projects, and simulant characterization, particularly Figures of Merit (FOM).

Technical Approach

Individual meetings were conducted with other projects, resulting in recommended simulants, and often simulant being shipped to the project. Characterization included acquiring data from APL LSIC, NASA analytical labs, and academia and calculating FOM.

Contributing Partners and/or Infusion Plans

Partners – APL LSIC, NASA ESDMD and SMD, commercial simulant vendors, academia for simulant properties

Infusion – STMD/GCD projects, Artemis equipment, CLPS payloads

Project Interactions (subset)

Project	Meeting or Discussion	Provided Simulant
Dusty Environments Classification and Testing	✓	NU-LHT-4M OB1A
MSFC V20 Chamber	✓	-
HALO HEPA Filter	✓	NU-LHT-4M sieved
MMPACT	✓	Provided by MMPACT
Patch Plate Materials Compatibility Assessment	✓	NU-LHT-4M sieved
Lunar Auger Dryer	✓	-
FLEET (ultrasonic blade, regolith transport)	✓	NU-LHT-4M OB1A, BP-1
CLPS LEXI payload	✓	BP-1
Open University (UK) –MMPACT collaboration	✓	NU-LHT-4M
DM GRAIN	✓	
KSC Pilot Excavator	✓	
Sierra Space Tipping Point	✓	GrenSpar 250
APL LSIC (sent CSM-LHS-1, CSM-LMS-1, LHS-1, LMS-1, OPRL2N, OB1A, NU-LHT-4M)	✓	for 2022 assessment

Figures of Merit (first pass)

Simulant	*Chemistry*	*Particle Size Distribution*
BP-1 (M)	86	94
CSM-LHT-1 (H)	89	97
CSM-LMT-1 (M)	89	97
GreenSpar 250 (H)	86	75
GreenSpar 90 (H)	86	71
JSC-1A (M)	92	94
LHS-1 (H)	89	84
LHS-1D (H-dust)	89	86
LMS-1 (M)	88	92
MLS-1 (M)	96	99
NU-LHT-2M (H)	96	84
OB1 (H)	87	78
OPRH4W30 (H)	88	97
OPRL2N (M)	87	94

(H)=lunar highland (M)=lunar mare a score of 100=lunar

based on ISO/DIS 10788, and Metzger et al. (2019) Measuring the fidelity of asteroid regolith and cobble simulants. Icarus 321 (632-646)