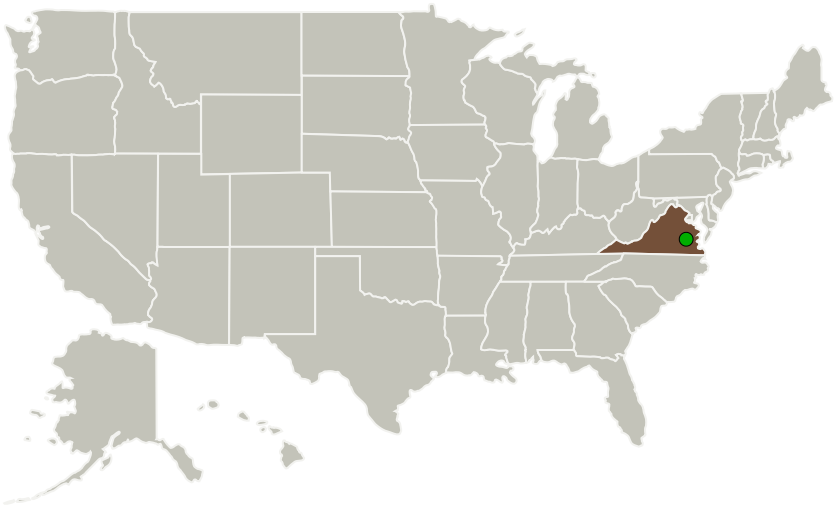
In-Situ Generation of Polymer Concrete Construction Materials, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Expanding the capability of human exploration is a primary goal for NASA and the In-Situ Resource Utilization (ISRU) program which focuses on transforming available material resources on extraterrestrial surfaces into usable materials and products. By identifying, collecting, and converting local resources into products that can reduce mission mass, cost, and/or risk, a sustainable manned expedition to Mars becomes closer to reality. Bulk or modified regolith can be combined with a binder as a concrete aggregate to form a construction material that can be extruded into bricks or slabs for structures, shelters, landing pads, roads, and shielding. With this goal in mind, researchers at Luna have identified a polymer concrete formulation based on urea-formaldehyde (UF) that can be pressed into high compressive strength interlocking bricks suitable for construction. Luna's binder system can also be produced in-situ from feed gases identified by NASA (N2, H2, CO2) while generating O2 and water. If successful, these UF polymers are also expected to have additional use in the production of plastic parts or components to support mission sustainability.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

June 2016: Project Start

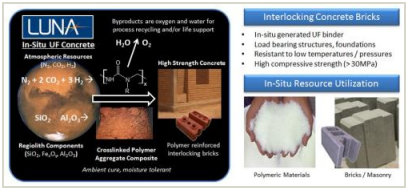
December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140085)*

Images

Briefing Chart Image
In-Situ Generation of Polymer Concrete Construction Materials, Phase I
(https://techport.nasa.gov/image/134208)



Final Summary Chart Image
In-Situ Generation of Polymer Concrete Construction Materials, Phase I Project Image
(https://techport.nasa.gov/image/131816)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Luna Innovations, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

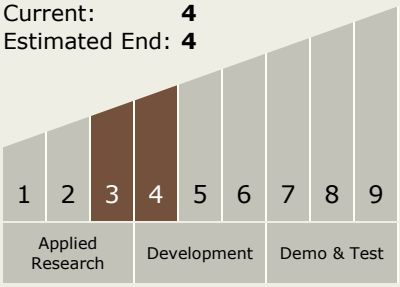
Carlos Torrez

Principal Investigator:

Benjamin Beck

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
  └ TX07.1 In-Situ Resource Utilization
    └ TX07.1.4 Resource Processing for Production of Manufacturing, Construction, and Energy Storage Feedstock Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System