



NASA SBIR/STTR Technologies

Advanced Carbothermal Electric (ACE) Reactor

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Proposal No: X3.01-9415



Identification and Significance of Innovation

ORBITEC proposes to develop the Advanced Carbothermal Electric (ACE) reactor to efficiently extract oxygen from lunar regolith. The ACE reactor uses innovative electric resistant elements to heat the regolith to temperatures up to 1900°C within a thermally insulated environment. The ACE reactor eliminates the problems encountered with traditional carbothermal hot-wall reactors and offers significant advantages over current carbothermal reactor approaches. The ACE reactor approach can also produce the processed regolith in a form that can be directly used as a structural material.

TRL beginning and end of contract: TRL 2 to 4



Technical Objectives and Work Plan

The objective of the Phase 1 project is to demonstrate the technical feasibility of the ACE reactor by using electric heating elements to heat lunar regolith and performing the carbothermal reduction process.

- Task 1. Define the design requirements*
- Task 2. Develop a process to coat MoSi₂ heating elements with iridium*
- Task 3. Conduct carbothermal reduction experiments*
- Task 4. Analyze heater elements after processing*
- Task 5. Preliminary design for a prototype ACE reactor*
- Task 6. Project management and reporting*

NASA and Non-NASA Applications

The ACE reactor will efficiently produce oxygen from the lunar regolith to satisfy oxygen requirements for EVA and life support in Exploration Surface Systems, and potentially provide LOX for propulsion requirements. The innovative electric resistance heaters developed for the ACE reactor could have a significant commercial market as the first high-temperature heating elements that can operate in oxidizing, reducing, or vacuum environments.

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NON-PROPRIETARY DATA