Oxygen Recovery via Carbon Dioxide Electrolysis with Microtubular Solid Oxide Cells

Completed Technology Project (2013 - 2016)

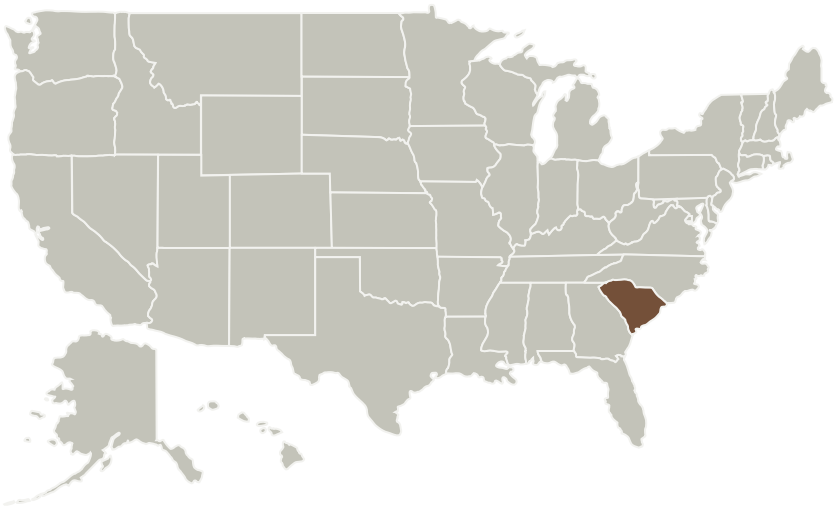
Project Introduction

Carbon dioxide reduction is considered a major shortcoming for the current Atmosphere Revitalization System. Novel technologies are desired so that the oxygen recovery rate can be significantly increased, thereby approaching full closure of the atmosphere revitalization loop. Microtubular solid oxide cells are being developed to carry out direct carbon dioxide electrolysis and achieve high oxygen recovery rates. The major research objectives include material development and innovation, cell fabrication and component assembly, so that the electrolysis performance and stability can be significantly improved. The research activity also includes electrochemical performance characterization and durability evaluation. The proposed project will provide a highly efficient oxygen recovery technology from direct carbon dioxide electrolysis, which can fulfill future space exploration needs. The proposed research will potentially obtain sustainability for future space exploration by operating solid oxide cell in electrolysis mode for oxygen recovery and fuel cell model for power generation alternatively. This project will bring innovative advancements of solid oxide cell technology beyond the NASA applications.

Anticipated Benefits

The proposed research will potentially obtain sustainability for future space exploration by operating solid oxide cell in electrolysis mode for oxygen recovery and fuel cell model for power generation alternatively. This project will bring innovative advancements of solid oxide cell technology beyond the NASA applications.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

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Organizations Performing Work	Role	Type	Location
Columbia University in the City of New York	Supporting Organization	Academia	New York, New York
University of South Carolina-Columbia	Supporting Organization	Academia	Columbia, South Carolina

Primary U.S. Work Locations
South Carolina

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

Program Director:

Claudia M Meyer

Program Manager:

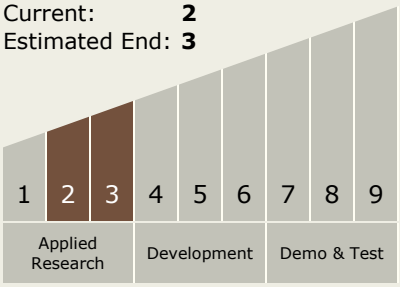
Hung D Nguyen

Principal Investigator:

Xingjian Xue

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    └ TX06.1.1 Atmosphere Revitalization