

Electrochemical Peroxide Generation, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

In this Phase I SBIR program, Faraday will develop a custom bench-scale electrochemical cell incorporating state of the art electrocatalysts in a gas-diffusion electrode (GDE) system to serve as proof-of-concept of the suitability of an electrochemical system for in situ hydrogen peroxide generation, to serve as a disinfectant solution for crew contact surfaces in space vehicles. Hydrogen peroxide is an appealing disinfectant due to its low toxicity and innocuous decomposition products (i.e., water and oxygen). Faraday will construct a bench-scale electroreactor to incorporate a custom-fabricated gas diffusion cathode and a commercial mixed-metal oxide anode, which will then be used in hydrogen peroxide generation tests. Adventitious hydrogen peroxide consumption at the anode will be avoided by inclusion of a selective membrane between the anode and cathode compartments. The performance of this electrochemical generation system will be enhanced through application of the FARADAYIC Process, which involves precise tuning of pulsed electrical potentials applied to the catalytic electrodes. The system will be characterized by the peroxide generation rate, the maximum achievable peroxide concentration, and the microbial disinfection capability demonstrated by the solutions generated. These efforts will provide a platform for scale-up and optimization efforts in Phase II and transition to commercialization in Phase III.

ANTICIPATED BENEFITS

To NASA funded missions:

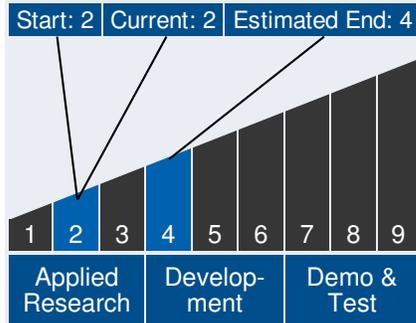
Potential NASA Commercial Applications: At present, surface disinfection in NASA space vehicles is accomplished through the use of pre-packaged, disposable, wetted wipes, which represent an appreciable carry-along mass and disposal burden. The proposed hydrogen peroxide generation system offers a more economical and practical alternative, with the disinfectant solution being generated in situ and applied to reusable cloths,



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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reducing both the carried and disposed mass associated with the disinfection process. The stock materials for the disinfectant solutions would consist of dry buffer salts and detergents, reconstituted with water from onboard supply prior to passage through the generation system and application to suitable reusable cloths.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The proposed innovation has the potential to be useful in a variety of situations where disinfection of contact surfaces is of importance. The specific application as described by the program solicitation topic is that of crew contact surfaces in space vehicles, but the system would be valuable in a broad range of other settings as well. Some potential applications include naval warships and military field hospitals, where lightweighting of the logistical chain is a key consideration. As well, chemical laboratory environments represent a possible application, where on-site generation of hydrogen peroxide for experimental use may be of value. More broadly, the global commercial market for hydrogen peroxide is sizeable, with a projected growth rate of 5.6% over the next decade. Thus, in addition to in situ generation applications, the technology could also be valuable as an alternative method for commercial synthesis of hydrogen peroxide.

Management Team *(cont.)*

Principal Investigator:

- E. Jennings Taylor

Technology Areas

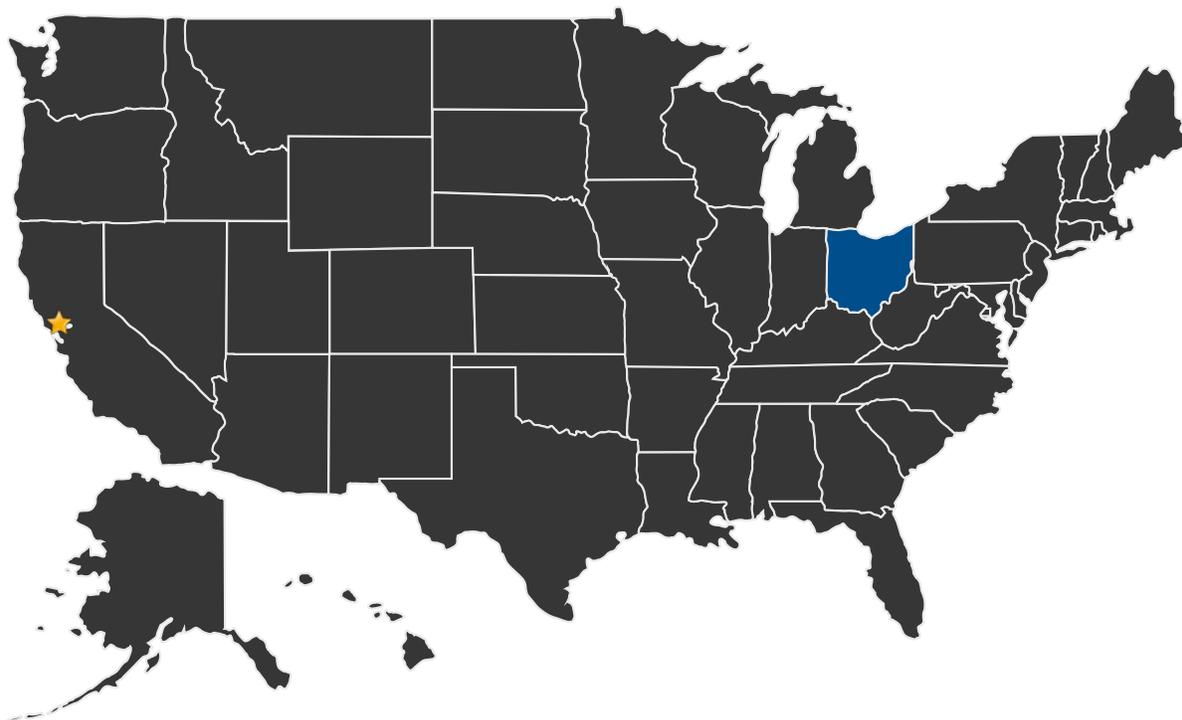
Primary Technology Area:

Human Health, Life Support, and Habitation Systems (TA 6)

- └ Environmental Control and Life Support Systems and Habitation Systems (TA 6.1)
 - └ Habitation (TA 6.1.4)



U.S. WORK LOCATIONS AND KEY PARTNERS



- U.S. States With Work ★ **Lead Center:**
Ames Research Center

Other Organizations Performing Work:

- Faraday Technology, Inc. (Englewood, OH)

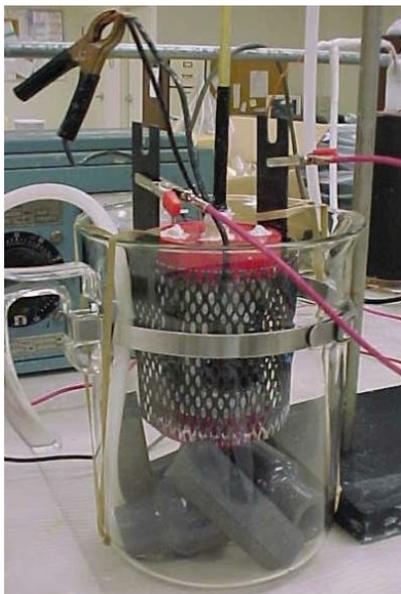
PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23331>)



IMAGE GALLERY



*Electrochemical Peroxide Generation,
Phase I*

DETAILS FOR TECHNOLOGY 1

Technology Title

Electrochemical Peroxide Generation, Phase I

Potential Applications

At present, surface disinfection in NASA space vehicles is accomplished through the use of pre-packaged, disposable, wetted wipes, which represent an appreciable carry-along mass and disposal burden. The proposed hydrogen peroxide generation system offers a more economical and practical alternative, with the disinfectant solution being generated in situ and applied to reusable cloths, reducing both the carried and disposed mass associated with the disinfection process. The stock materials for the disinfectant solutions would consist of dry buffer salts and detergents, reconstituted with water from onboard supply prior to passage through the generation system and application to suitable reusable cloths.