

Opportunity Title: Advanced Solid State Lithium-Sulfur Battery Electrochemistry and Materials Development

Opportunity Reference Code: 0007-NPP-NOV23-GRC-AeroEng

Organization National Aeronautics and Space Administration (NASA)

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Application Deadline 11/1/2023 6:00:59 PM Eastern Time Zone

Description US Citizens and Lawful (US) Permanent Residents (LPRs)

Future NASA aerospace and planetary exploration missions will require advanced aerospace power technologies to provide safe, reliable and highly efficient electrical power. To address the technical challenges imposed on an electrochemical energy storage subsystem component of a viable aerospace power system, research objectives focus on the conception, development, characterization, and performance evaluation of novel electrochemical cell and battery materials and components, as well as on the development and assessment of new cell chemistries, especially those derived through In-Situ Resource Utilization (ISRU).

Position Summary

Senior Postdoctoral Researcher position in advanced structured materials and cell development of "next generation" batteries within the Materials Chemistry and Physics Branch at NASA Glenn Research Center. We are looking for a highly motivated scientist who must have obtained a PhD with a strong background in materials science, electrochemistry and in electrochemical energy storage systems such as Li-sulfur and Sodium-ion batteries. Experience in (1) Li-ion and ""Beyond Li ion"" battery cells development, testing and analysis; (2) synthesis, development and characterization of electro-active (nano)materials such as cathodes, ionic liquids and solid state electrolytes; (3) battery cell assembly; (4) computational methods in battery research; and (5) microscopy/spectroscopy analytical techniques are essential requirements. A proven track record evidenced by publications in top quality journals is essential, and direct experience in the formulation of sodium-ion cells is desirable.

Posts Duration: February 1st, 2022 until January 31, 2024

Key Duties and Responsibilities

This is an advanced research training role, building on their prior experience as a Post-Doctoral Researcher or a graduate student, where you will conduct a specified program of research and research training under the guidance of a Principal Investigator. The primary purpose of the role is to deliver research results and objectives, develop new or advanced research skills and competencies, the successful development of funding proposals and to interact with senior scientists and engineers on multi-center team composed of NASA Glenn, Marshall and Ames Centers, and several academic and industrial partners. The Post-Doctoral/Senior Post-Doctoral phase has an expected duration up to a maximum of 3 years, subject to the term of the project, on a full-time or part-time basis. The researcher will be mentored by a Principal Investigator (PI). The primary focus of the Senior Postdoctoral Researcher will be research however a particular emphasis during this stage should include:



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To support the Principal Investigator and research group in the design and development of a research plan

To engage in appropriate training and professional development opportunities as required by the project objectives

To assume a role in the design as well as the execution of research, contributing significantly to the development of research proposals and funding successes.

To engage in the dissemination of the results of the research in which they are engaged, as directed by, with the support of and under the supervision of a Principal Investigator.

Criteria

A PhD qualification in Chemistry, Physics, Materials Science or Engineering. We seek highly motivated candidates who are able to show a proven excellent record in research, and are ready to thrive in a dynamic, multi-cultural and multi-disciplinary team. The successful candidate should demonstrate a strong track record in electrochemistry and energy storage materials and devices.

The candidate is expected to be highly self-motivated, able to lead other research engineers and graduate students in a multi-discipline research team, and able to propose research

Appropriate research experience in lithium-ion, sodium-ion, and/or other next generation batteries that includes synthesis of relevant materials, nanomaterials and electrolytes; surface analysis and electrochemical analytical methods (FTIR, Raman, UV, impedance spectroscopy); battery cell assembly, scale-up, and testing; computational methods in battery materials and integration research. A background in ionic liquids and solid-state Li/Na ion conducting electrolytes, as well as knowledge of the methods for materials morphological, textural and microstructural characterization and analysis are

Previous postdoctoral or graduate experience in the synthesis and development of components, their testing and integration into cells is highly desirable.

Previous experience with direct-ink-writing of 3-dimensional energy storage components is desirable.

A capability of working well within a project team to achieve group oriented results in parallel to individual productivity, ability to independently drive the research topic within the framework of the project-defined structure and produce top quality publications.

Good communication, organization and interpersonal skills, and experience in presentation to international conferences are required.

Description

The focus of the project is on the design and development of functioning sodium-ion cell using materials derived through ISRU of lunar sediments.

The program requires developing mechanistic understanding of redox active materials derived from lunar resources, develop viable electrolyte materials, cathode structures, and cell integration for lithium/sodium-based batteries. The work involves extensive electrochemical studies of the above redox systems in various ionic liquid and solid-state electrolytes, as well as

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device fabrication and characterization. Important part of this work is based on experimental validation and further development of computational physics-based simulations of cells with advanced 3-dimensional Li/Na battery systems. The position requires interaction with other group members located at several NASA centers. Research activities are strongly supported by state-of-the-art battery development, computational analysis, and analytical facilities for chemical, thermal, and physical analyses and material characterization; electrochemical instrumentation for fundamental studies; and inert atmosphere glove boxes for sensitive material synthesis and handling. Laboratory instrumentation and facilities are also complemented by several multi-channel battery test systems for component screening and evaluation, charge-discharge cycle testing as a function of temperature, and for cell/battery life testing. A unique dry room facility augments the electrochemical and analytical laboratories by providing a dry (<1% RH) working environment for the fabrication and characterization of moisture sensitive materials.

Location:

Glenn Research
Center, Cleveland, Ohio

Field of Science: Aeronautics, Aeronautical or Other Engineering

Advisors:

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- Eligibility Requirements**
- **Citizenship:** LPR or U.S. Citizen
 - **Degree:** Doctoral Degree.