Opportunity Title: Beyond Li-ion: Towards the Next Generation of Space Power Fellowship
Opportunity Reference Code: ICPD-2024-21

Organization Office of the Director of National Intelligence (ODNI)

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 3 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at: https://orise.orau.gov/icpostdoc/index.html.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 3/4/2024 12:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

This research topic aims to examine alternative and exotic battery chemistries, to assess and investigate what could be the next generation of batteries for powering spacecraft of tomorrow. As the technology flown on-orbit becomes more sophisticated, their power needs increase as well, making the battery systems that store power from their solar cells ever more critical. The role of the battery is to insure that a consistent supply of electricity can be fed to the necessary satellite subsystems, independent of solar panel exposure (i.e. during eclipse conditions).

This effort will investigate one or more battery chemistries beyond Li-ion to determine if they are viable alternatives for the next generation of space power. A variety of metrics, including size, weight, and power (SWAP), materials criticality/supply chain, useable lifetime, and performance over multiple charge/discharge cycles should be considered, and compared to the current state-of-the-art.

Example Approaches:

This topic can be approached from an experimental or an analytical standpoint. An experimental approach would identify a candidate battery chemistry, such as a metal-based or chalcogenide-based battery, assess the advancements necessary for space implantation (e.g. processing, increased capacity, etc.), and conduct research on at least one of these routes to advancement.

An analytical approach would be to conduct a detailed survey of viable alternative battery chemistries and determine appropriate metrics to accurately compare and contrast the tradeoffs of different battery systems to the traditional Li-ion. This approach would follow a style similar to life-cycle analyses comparing different renewable energy sources, assessing

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their technology advancement, finding common metrics to compare performance, processing, and suitability for space, and analyzing the more complex differences between technologies.

Relevance to the Intelligence Community:

- Chemical Sciences, Energy and Power, Materials and Manufacturing, Space, Other
- Emerging technology, endurance, high density, SWAP, storage, operations, resilience, satellites, unconventional, imaginative
- Develop/enhance overhead communications infrastructure
- Develop/enhance capabilities for low-observable, all-weather, long-dwell platforms
- Develop/enhance power source capabilities with improved energy density and increased cycle life
- Develop/enhance methods to identify and evaluate game-changing emerging technologies with dual-use potential

Key Words: electrochemistry, battery, space power, satellite, supply chain, sustainability, space

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the appointment start date
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Communications and Graphics Design** (6)
  - **Computer, Information, and Data Sciences** (17)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (11)
  - **Other Non-Science & Engineering** (2)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (30)

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