

Opportunity Title: Microfluidic electrochemical sensor instrument development for life detection and habitability science

Opportunity Reference Code: 0280-NPP-MAR24-JPL-TechDev

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0280-NPP-MAR24-JPL-TechDev

How to Apply All applications must be submitted in [Zintellect](#)

Application Deadline 3/1/2024 6:00:59 PM Eastern Time Zone

Description Description:

This opportunity is for research on the development of microfluidic instruments using electrochemical sensors for measuring soluble properties of samples in support of life detection and habitability science. Measurements made by the Wet Chemistry Lab (WCL) on the Mars Phoenix Lander demonstrated the power of soluble chemical analysis via electrochemical sensors when WCL detected perchlorate on Mars for the first time [1]. Since that time our group has continued to develop electrochemical sensors in smaller more robust packages to make them suitable for longer duration missions to Ocean Worlds [2]. Critically, the general instrument capability of an Electrochemical Sensing Array has been called out by the Enceladus Orbilander Flagship Mission Concept as a core portion of the strawman Life Detection instrument suite payload, demonstrating the communities' desire to continue developing and deploying these sensors. Ongoing research is focused on the continued miniaturization of the sensors via 2D and 3D fabrication methods as well as the overall reduction in sample volume required to make measurements. Additional research focuses on expanding the list of targets that can be specifically detected, and improving sensor reliability by moving towards stable calibration/calibration free sensors.

[1] Hecht, M.H., et al., Detection of Perchlorate and the Soluble Chemistry of Martian Soil at the Phoenix Lander Site. *Science*, 2009. 325(5936): p. 64-67. 10.1126/science.1172466

[2] Jaramillo, E.A. and A.C. Noell, Development of Miniature Solid Contact Ion Selective Electrodes for in situ Instrumentation. *Electroanalysis*, 2020. 32(9): p. 1896-1904. 10.1002/elan.201900761

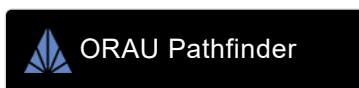
[3] MacKenzie, S.M., et al., The Enceladus Orbilander Mission Concept: Balancing Return and Resources in the Search for Life. *The Planetary Science Journal*, 2021. 2(2): p. 77. 10.3847/PSJ/abe4da

Field of Science:

- Technology Development

Advisors:

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Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States. A complete list of Designated Countries can be found at:

<https://www.nasa.gov/oiir/export-control>.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

Qualifications Qualified candidates will have strong laboratory and/or instrumentation skills with experience in some or all of the following: analytical chemistry and biochemistry instrumentation, electrochemistry, sensor fabrication, ion selective electrodes, and microfluidic device manufacturing.

Eligibility Requirements • **Degree:** Doctoral Degree.