Opportunity Title: Computational Materials Science for In-Space Welding, Joining, and Additive Manufacturing
Opportunity Reference Code: 0017-NPP-MAR24-MSFC-Interdisc

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0017-NPP-MAR24-MSFC-Interdisc

How to Apply All applications must be submitted in Zintellect

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

Description **Description:**

NASA Marshall Space Flight Center (MSFC) is advancing welding, joining, and additive manufacturing (AM) processes for in-space environments that will build structures and space craft components in Earth orbit, Lunar orbit, the Lunar surface, and beyond. The approach will infuse Integrated Computational Materials Engineering (ICME) tools that link the physics and length scales of process modeling, metallurgical modeling, and atomistic techniques into these in-space domains. These tools will be calibrated in parallel with experimental data and materials diagnostics. Areas of interest include the following: Novel materials and modified (existing) materials; materials predictive modeling via CALculation of Phase Diagrams (CALPHAD) for phase stability, Kampmann-Wagner Numerical (KWN) for precipitation, atomistic Density Functional Theory (DFT) and Molecular Dynamics (MD) approaches, solidification modeling via Phase Field (PF) and other techniques suitable to equilibrium and far-from-equilibrium conditions, Computational Fluid Dynamics (CFD), Finite Element Analysis (FEA), and also integration via Artificial Intelligence (AI) / Machine Learning (ML) approaches. This ICME scheme will evaluate the effects of microgravity, reduced pressures down to vacuum, and extreme temperatures & thermal cycles associated with in-space environments on the melting, solidification, and subsequent mechanical behavior of materials subject to processing.

The Biological and Physical Sciences (BPS) group at MSFC and the MSFC Materials and Processes Laboratory (EM) are seeking a postdoctoral scholar to develop and apply their expertise to the ICME workflow for in-space applications. The postdoc will apply models in order to innovate novel and existing processes and alloys for in-space welding, joining, and AM. These efforts will closely align with existing and planned International Space Station, parabolic flight, and drop tower experiments for validation of such models. MSFC is well-equipped with computational tools & resources and materials diagnostic tools; it has a long history of performing microgravity materials science experiments in collaboration with academic and external partners. These ICME investigations will identify existing shortcomings in the physical understanding of the boundary conditions needed for computational modeling of in-space welding, joining, and AM processes and will develop new physics-based modeling approaches to advance the state-of-the-art beyond such obstacles.

Field of Science: Interdisciplinary

Advisors:

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Qualifications

Experience with computational materials science and fluid dynamics methods and techniques highly desired. While an applicant need not have experience in all of these, relevant methods may include but are not limited to: density functional theory, molecular dynamics, CALPHAD, phase field modeling, cellular automata, lattice Boltzmann, volume of fluid, and finite element. Experience with high-performance computing platforms, including parallelization and Unix environments, desired.

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.