

Opportunity Title: Fundamental studies of materials degradation in molten chloride salts

Opportunity Reference Code: ORNL-HBCU-MEI-2018-0009

Organization Oak Ridge National Laboratory (ORNL)

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- **How to Apply** Applicants must apply through the Zintellect application system. The deadline to apply is 11:59PM ET on February 9, 2018.
- Application Deadline 2/9/2018 11:59:00 PM Eastern Time Zone
 - Description Project Description: Degradation of structural materials is a concern for materials in molten salt reactors and concentrated solar power systems. Prior work has shown that selective dissolution of chromium is the primary mechanism driving corrosion-degradation of structural alloys in molten chloride and fluoride salts, yet our scientific understanding of the underlying processes is wholly inadequate. Accordingly, this work undertakes the means to rigorously understand the chemical and physical factors which control dissolution of chromium in a molten chloride. Such fundamental understanding of chromium behavior in molten salts is needed for advanced material development, accurate lifetime predictions, and development of a predictive modeling capability to aid in the qualification and deployment of molten salt reactors. The multi-disciplinary approach presented in this work employs capsule testing of chromium and Ni-Cr alloys in molten KCI-MgCl₂ salt. Salt-metal systems are analyzed with XAFS to provide key data regard speciation and coordination. These data will provide inputs for CALPHAD models of salt-alloy systems, and providing necessary data for future predictive modeling of molten salt reactors and/or CSP systems. Additionally, new techniques and pathways will be developed for practical analysis of the liquid/solid interface and for the bulk chemistry of the molten salt.



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Research Team: Stephen Raiman, Jake McMurray, Richard Mayes, Carter Abney, James Keiser, Benjamin Betzler

Division: Materials Science and Technology Division

For additional information, please contact Stephen Raiman, raimanss@ornl.gov.

Qualifications 1. General familiarity with molten salts and corrosion of alloys in molten salts. Depending on the project proposed, familiarity with molten salt chemistry, XAFS/XANES or computational modeling would be helpful

Eligibility

lity • Degree: Master's Degree or Doctoral Degree.

Requirements

- Discipline(s):
 - Business (<u>11</u> [●])

• Academic Level(s): Faculty.



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- Chemistry and Materials Sciences (<u>12</u>)
- Communications and Graphics Design (6.)
- Computer, Information, and Data Sciences (16)
- Earth and Geosciences (21 (*)
- Engineering (<u>27</u> [●])
- Environmental and Marine Sciences (14)
- Life Health and Medical Sciences (45.)
- Mathematics and Statistics (<u>10</u>)
- Other Non-Science & Engineering (13.)
- Physics (<u>16</u>)
- Science & Engineering-related (1.)
- Social and Behavioral Sciences (<u>28</u>)
- Affirmation I certify that I am a full- time member of the teaching faculty at a HBCU/MEI accredited U.S. institution of higher education. I have confirmed my institution is eligible by visiting

http://www.orau.org/ornl/faculty/documents/minority-serving-institutions.pdf.