



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001**

Grant # 31310020M0005

Grantee: Texas A&M Engineering Experiment Station

Title of Grant: Heat Transfer Experimental and Computational Data for Molten Salt Reactors Applications.

Period of Performance: 9/30/2020-9/29/2023 (FY20 Notice of Funding Opportunity NOFO)

Executive Summary

We will generate high-fidelity heat transfer experimental and computational data to advance the predicting capabilities of existing and new heat transfer correlations for molten salt environments. The data will be generated under prototypical operating conditions, and for geometrical configurations of major interest for the molten salt reactor designs. Local effects, including solidification of the salt, and fouling of the surfaces will be studied. The data generated will ultimately fill the gaps in heat transfer data needs for Chloride molten salt reactors and advance the predictive capabilities of system-level computer codes included in the BlueCRAB codes suite.

Impact

- We will produce a unique high-fidelity experimental and computational heat transfer database for molten salt reactor applications.
- The database will advance the predictive capabilities and reduce uncertainty of the prediction of heat transfer correlations for molten salt applications.
- The database produced will support the increase of SAM's predictive capability maturity, and the overall code readiness, and support the validation advanced CFD codes (Nek5000 and Fluent)
- Simulations and experimental results will become available for generation of reduced order models, for direct implementation into BlueCRAB specialized code SAM.

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Presentations and Publications

The list of publications was submitted with the final report after grant expiration.

- Physics of Fluids Journal: J. Reis, J.Seo and Y, Hassan, “*Flow Visualization Experiments of Argon Injection in a Molten Salt Natural Circulation Loop*” Physics of Fluids **36**, (2024), <https://doi.org/10.1063/5.0205177>
- Nuclear Engineering and Design Journal: J.Reis, J.Seo, and Y. Hassan, “*Consequences of Molten Salt Solidification in a Natural Circulation Flow Visualization Loop Due to Heater Failure*” Nuclear Engineering and Design Vol. 424 (2024), <https://doi.org/10.1016/j.nucengdes.2024.113278>
- Nuclear Technology Journal: J. Reis and Y. Hassan, “*SAM Code Validation for High Prandtl Number Flow in Molten Salt Natural Circulation Facility*” Nuclear Technology ISSN:0029-5450 (2025), <https://doi.org/10.1080/00295450.2025.2480974>
- Physics of Fluids Journal: J. Reis, J.Seo and Y, Hassan, “*Molten Salt Flow Visualization to Characterize Boundary Layer Behavior and Heat Transfer in a Natural Circulation Loop*” Physics of Fluids **36**, (2024), <https://doi.org/10.1063/5.0197276>

Patents

N/A