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

Grant # 31310021M0050
Grantee: University of Texas at Arlington
Title of Grant: High-Fidelity Experiments and Simulations of Heat Pipe Performance under Steady-State, Transient, and Accident Conditions
Period of Performance: 9/28/2021-9/27/2024 (FY21 Notice of Funding Opportunity NOFO)

Executive Summary

The objective of this proposal is to conduct high-fidelity experiments, modeling and simulations of Liquid Metal Heat Pipes for micro-reactor applications under steady-state, transient, and accident conditions. The data produced will support the validation of the specialized tools included in the Comprehensive Reactor Analysis Bundle (CRAB). We will produce unique sets of measurements of internal thermal-hydraulic parameters using advanced techniques, and measurements' uncertainty will be quantified. The datasets produced will fill the known technology gaps can be 'directly' used for the development of code closure models, and ultimately advance the predictive capabilities of Computational Fluid Dynamics (CFD) codes and system codes adopted for heat pipe reactors technologies.

Impact

- We will produce a unique high-fidelity experimental and computational database for liquid-metal heat pipes with uncertainty.
- The database will support the validation and increase SAM's predictive capability maturity level, and other MOOSE-based tools.
- The database will become available for validation of other specialized codes.

Principal Investigator: Dereje Agonafer, – University of Texas at Arlington (UTA), agonafer@uta.edu

Co-Principal Investigator: Ratan Kumar – University of Texas at Arlington (UTA), ratan.kumar@uta.edu

Co-Principal Investigator: Yassin A. Hassan - Texas A&M University (TAMU). y-hassan@tamu.edu

Co-Principal Investigator: Rodolfo Vaghetto – Texas A&M University (TAMU), r.vaghetto@tamu.edu

---

Presentations and Publications

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

- NURETH-20 Conference: D. Orea, N.K. Anand, and Y. Hassan, "*Vapor Pressure and Temperature Analyses on a Gravity-Assisted Wrapped Screen Wick Annular Heat Pipe".* 20th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-20)

- Physics of Fluids Journal: D. Orea, N.K. Anand, and Y. Hassan, "*Experimental Investigation of Thermal Performance and Flow Behavior with Wavelet Analysis in an Annular Wrapped Screen, Heat Pipe". Physics of Fluids* **35**, 092117 (2023). doi: 10.1063/5.0156589

Patents

N/A