

A new experiment for determining evaporation and condensation coefficients of cryogenic propellants and development of an efficient computational model of cryogenic film stability in microgravity

Research Team

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Approach

1. Neutron Imaging (NIST)
2. Kinetic and Thermal Transport Modeling of Evaporation & Condensation
3. Spatiotemporal Evolution Equation for Simulating Evaporation and Condensation of Cryogenic Propellants in Zero Gravity

Research Objectives

- I. Develop a standard method for measuring accommodation coefficients for evaporating hydrogenated cryogenic propellants using neutron imaging.
- II. Develop a numerical simulation of cryogenic hydrogen and methane that couples the vapor phase to the liquid via a kinetic model of phase change.

Potential Impact

1. Obtain fundamental knowledge and data on evaporation and condensation of cryogenic propellants.
2. More thorough understanding of underlying physics of cryogenic evaporation and condensation.
3. Computationally efficient method for accurate prediction of interface dynamics and local thermodynamic conditions
4. Foundation for establishing the minimum size of system-level technology demonstrations.

