

INTERIM REPORT

**NRC Research and Technical
Assistance Report**

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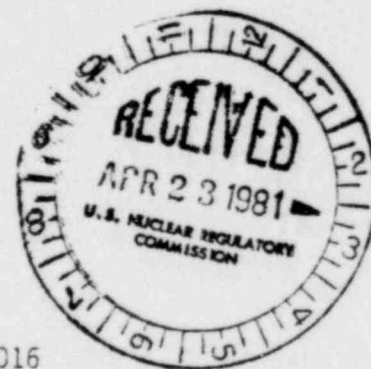
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Monthly Highlights

for

March 1981*

Thermal Hydraulic LMFBR Safety Experiments
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1. Thermal Hydraulic Reactor Safety Experiments

1.1 Heat Transfer in Core-Concrete Interactions (G. A. Greene)

Interfacial mixing studies of immiscible liquid layers with gas agitation continued.

Additional average void fraction measurements by gas injection into adiabatic multilayered systems were performed.

The apparatus for heat transfer studies has been completed. The instrumentation rack has been installed. The first series of experiments on interfacial heat transfer between immiscible liquid layers with gas agitation have begun. One liquid layer (lower) is internally heated.

1.2 LWR Steam Spike Phenomenology (T. Ginsberg)

Preliminary steam spike simulation experiments have been initiated. Initial tests are being conducted with 3 mm diameter stainless steel spheres, heated to 500°F. Five kilogram quantities of steel are dropped into columns of water, preheated to approximately 185-190°F. The quantity of water is a variable, ranging from 4 kg (equivalent to a 0.5 m high column of water) to 12 kg (1.5 m column of water). These experiments are being used to debug the experimental apparatus, as well as to provide preliminary data to evaluate analytical models of the interaction.

1.3 HFDA Bubble Energetics: Role of Taylor Instabilities

Calculations have been performed using the multiphase bubble model for Taylor instability at the bubble liquid sodium interface during HFDA bubble expansion. The model applies separate equations for the vapor phase and for the heavy liquid/solid phase of the expanding bubble. The phases are coupled in the momentum equations by interfacial drag.

The calculation results indicate:

- (i) Interfacial drag reduces the growth rate of interfacial disturbances.
- (ii) The heavy-phase component composition in the bubble affects the "cut-off wavenumber" beyond which disturbances will not grow.
- (iii) There exists a bubble void fraction below which interfacial disturbances will not grow. This conclusion supports earlier intuitive predictions based upon the original Taylor theory.

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