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Impact of Nonzero Initial Heat Flux Increase on Pool Boiling Curves: A Transient Versus Stationary Comparison

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Boiling curves, which relate heat flux density to surface superheating, are traditionally derived under stationary conditions and widely used for modeling heat exchange in power equipment. However, real-world scenarios often involve rapid increases in heat flux, such as in reactor power surges or superconducting systems. This study experimentally investigates the differences between boiling curves obtained under stationary and nonstationary heat release conditions in water at atmospheric pressure using a thin horizontal cylindrical heater. The results demonstrate a shift of the boiling curve toward higher dissipated heat fluxes with increasing heating rates. The paper quantifies the deviation between stationary and nonstationary curves and identifies conditions where stationary correlations remain applicable.

Technical Track

Nuclear Thermal-Hydraulics

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