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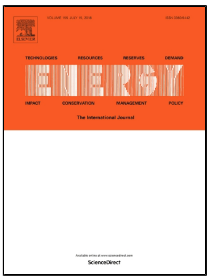

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MECHANISTIC MODELLING OF DRYOUT AND POST-DRYOUT HEAT TRANSFER

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ABSTRACT

In this paper a new mechanistic model for the diabatic annular two-phase flow is presented and applied to prediction of dryout and post-dryout heat transfer in various channels. The model employs a computational fluid dynamics code – OpenFOAM® – to solve the governing equations of two-phase mixture flowing in a heated channel. Additional closure laws have been implemented to calculate the location of the dryout and to predict wall temperature in the post-dryout region. Calculated results have been compared with experimental data obtained in pipes and good agreement between predictions and measurements has been achieved. The presented model is applicable to complex geometries and thus can be used for prediction of post-dryout heat transfer in a wide variety of energy conversion systems.

KEYWORDS
Dryout, Post-Dryout, Annular Flow, Liquid Film, Droplets

Nomenclature

α_k	Volume fraction of phase k
δ	Film thickness
δ_c	Critical film thickness
Γ_{evp}	Evaporation rate of the liquid film
Γ_k	Mass source gained by phase k
Γ_g	Mass source gained by the gas from evaporation of the liquid film
φ	Liquid film property variable
μ_g	Gas dynamic viscosity
μ_l	Liquid dynamic viscosity
ρ_g	Gas density
ρ_l	Liquid density
σ	Surface tension
τ	Effective stress due to both molecular and turbulent effects