Title	In-vessel Coolability and Steam Explosion in Nordic BWRs
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Abstract

The objective of this research is to reduce the uncertainty in quantification of steam explosion risk and in-vessel coolability in the Nordic BWR plants which employ cavity flooding as severe accident management (SAM) strategy.

To quantify the coolability of debris bed packed with irregular particles, the friction laws of fluid flow in particulate beds packed with non-spherical particles were investigated on the POMECO-FL test facility, and the experimental data suggest that the Ergun equation is applicable if the effective particle diameter of the particles is represented by the equivalent diameter of the particles, which is the product of Sauter mean diameter and shape factor of the particles. One-way coupling analysis between PECM model for melt pool heat transfer and ANSYS thermo-structural mechanics was performed to analyze the vessel creep, and the results revealed two different modes of vessel failure: a 'ballooning' of the vessel bottom and a 'localized creep' concentrated within the vicinity of the top surface of the melt pool. Single-droplet steam explosion experiments were carried out by using oxidic mixture of WO_3-CaO, and the results show an apparent difference in steam explosion energetics between the eutectic and non-eutectic melts at low melt superheat (100 ^oC).

Key words severe accident, debris coolability, steam explosion

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