

## Accepted Manuscript

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PII: S1359-4311(18)34271-6  
DOI: <https://doi.org/10.1016/j.applthermaleng.2018.09.074>  
Reference: ATE 12683

To appear in: *Applied Thermal Engineering*

Received Date: 10 July 2018  
Revised Date: 9 September 2018  
Accepted Date: 16 September 2018

Please cite this article as: L. Zhang, Z. Ma, Y. Zhang, G.H. Su, S. Bu, W. Sun, L. Pan, Study of the transient heat transfer characteristics in internally heated corium pool, *Applied Thermal Engineering* (2018), doi: <https://doi.org/10.1016/j.applthermaleng.2018.09.074>

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# Study of the transient heat transfer characteristics in internally heated corium pool

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## Abstract

The heat transfer characteristics during different transients are the critical problems in the study of thermal behaviors in volumetrically heated corium pools. In this paper, the COPRA experiments simulating the reactor vessel lower head at 1:1 scale were performed. The nitrate mixture of 20% NaNO<sub>3</sub>–80% KNO<sub>3</sub> in mole fraction was employed as the reactor corium simulant. This study mainly focused on the pool temperature change, heat flux variation and crust thickness evolution during two corium relocation stages and heating power transition stages. Then the transient model was developed and the simulation was validated with COPRA tests and reactor case. The calculation results of primary parameters all agreed well with experimental data during entire tests. Furthermore, the model was applied to reactor situation with prototypical corium and compared with LES results.

**Keywords:** Corium pool; COPRA; Transient; Heat transfer; Model development

## 1. Introduction

delete deleteThe severe accident in reactors may cause cooling water shortage and lead to the formation of hemispherical corium pool with internal decay heat, which will impose great thermal load towards the vessel wall and threaten its integrity. The creep rupture and boiling crisis when the local heat flux exceeds the corresponding critical heat flux were the primary failure mechanism for vessel wall. The object of

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