

反应堆工程

# 核动力装置自然循环及其过渡过程计算模型的建立

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**摘要** 为准确分析含反应性反馈的核动力装置自然循环及其过渡过程中重要参数的响应特性, 以核动力装置瞬态最佳估算程序RELAP5/MOD3为基础, 采用两群三维时空中子动力学模型替代RELAP5/MOD3的点堆模型, 并建立三维空间内中子物理与热工水力的耦合模型, 编制相应的计算程序。利用所研制的程序对实际核动力装置的自然循环及其过渡过程进行分析计算, 并与试验结果进行比较。结果表明:本文建立的时空中子动力学计算模型克服了点堆方程不能准确计算反应性反馈的缺点, 计算精度高, 研制的程序可作为核动力装置强迫循环与自然循环及其过渡过程的计算分析工具。

关键词 [核动力装置](#) [自然循环](#) [过渡过程](#) [计算模型](#) [试验验证](#)

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## Models Development for Natural Circulation and Its Transition Process in Nuclear Power Plant

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**Abstract** On the basis of nuclear power plant (NPP) best-estimate transient analysis code RELAP5/MOD3, the point reactor kinetics model in RELAP5/MOD3 was replaced by the two-group, 3-D space and time dependent neutron kinetic model, in order to exactly analyze the response of key parameters in natural circulation and its transition process considering the reactivity feedback. The coupled model for three-dimensional physics and thermohydraulics was established and corresponding computing code was developed. Using developed code, natural circulation of NPP and its transition process were calculated and analyzed. Compared with the experiment data, the calculated results show that its high precise avoids the shortage that the point reactor equation can't reflect the reactivity exactly. This code can be a computing and analysis tool for forced circulation and natural circulation and their transitions.

**Key words** [nuclear power plant](#) [natural circulation](#) [transient process](#) [mathematic models](#) [experiment confirmation](#)

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