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中国先进研究堆冷中子源中子性能和自稳特性优化研究

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摘要 针对中国先进研究堆(CARR)冷中子源的技术难点, 研究采用国际上尚无先例的带助冷冷包结构及带助冷两相热虹吸自然循环冷却方式的可行性。在此基础上, 开展了新冷却方式下冷包内液氢形状的优化, 对不同冷包结构下的中子性能进行分析, 优化出较好的冷包结构。针对该冷却方式, 开展了对冷中子源运行稳定性至关重要的自稳特性的研究, 推导出具有一阶惯性环节的自稳特性方程。通过对方程解的分析, 证明了CARR新冷却方式具有较好的自稳特性并可据此开展优化分析。

关键词 [中国先进研究堆](#) [冷中子源](#) [月牙形冷包](#) [带助冷两相热虹吸](#) [中子性能](#) [自稳特性](#)

分类号

Optimization study on neutronics and self-regulation of cold neutron source for China Advanced Research Reactor

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Abstract The feasibility of the new cooling method in the world, two-phase thermo-siphon with auxiliary cooling, was studied in order to resolving the difficulties in the design of China Advanced Research Reactor (CARR) cold neutron source (CNS). On the basis of feasibility of new cooling method, the shape of liquid hydrogen in moderator cell was optimized and the better configuration of moderator cell is founded by lots of neutronics analysis. Additionally, the self-regulation characteristics, which is most important to the stable operation, was researched and the equation of one-order inertial self-regulation was derived by the study of non-balanced thermodynamic analysis. Analysis to the equation results shows that good self-regulation characteristics could be possessed of and optimized.

Key words [China](#) [Advanced](#) [Research](#) [Reactor](#) [cold](#) [neutron](#) [source](#) [crescent](#) [cell](#) [two-phase](#) [thermo-siphon](#) [with](#) [auxiliary](#) [cooling](#), [neutronics](#) [self-regulation](#) [characteristics](#)

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