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反应堆工程

高温气冷堆新型燃料球传感器的设计

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摘要 对高温气冷堆中燃料球运行情况的准确监测是保障反应堆安全可靠运行的关键。针对原有探测器的不足，利用穿透式涡流检测原理提出了新型对装式燃料球传感器。运用有限元方法建立了该传感器的电磁场数值计算模型，对传感器结构参数和检测参数进行了分析和优化设计。实验结果表明，该传感器过球信号信噪比高，对连续过球具有很好的分辨率，满足反应堆现场使用要求。

关键词 高温气冷堆 燃料球 传感器 有限元模型

分类号

Development of Novel Sensor for Fuel Balls Detection in High Temperature Gas-Cooled Reactor

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Abstract It is critical for the safe and reliable operation of high temperature gas-cooled reactor (HTGR) to accurately monitor the running of the fuel balls in HTGR. To overcome the disadvantages of present detectors, a novel external mounted sensor was presented based on the theory of through-transmission eddy current testing. A numerical computation model of the sensor for electromagnetic field analysis was established by using finite element method. The parameters of the structure and exciting circuit were analyzed to optimize the design. Experimental results show that the sensor takes a high signal-to-noise ratio and has an excellent resolution for continuous passages of fuel balls, which meets the requirements of application in HTGR.

Key words

high temperature gas-cooled reactor _ fuel ball _ sensor finite element model

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