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10MW高温气冷堆包覆燃料颗粒辐照考验

@朱钧国\$清华大学核能与新能源技术研究院!北京102201 @杨冰\$清华大学核能与新能源技术研究院!北京102201 @唐春和\$清华大学核能与新能源技术研究院!北京102201 @张秉忠\$清华大学核能与新能源技术研究院!北京102201 @邵友林\$清华大学核能与新能源技术研究院!北京102201 @徐世江\$清华大学核能与新能源技术研究院!北京102201

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摘要 TRISO型包覆燃料颗粒由燃料核芯、疏松热解炭层、内致密热解炭层、碳化硅层和外致密热解炭层组成。在冷态性能检验合格的基础上,进行了10MW高温气冷堆包覆燃料颗粒的静态辐照试验和动态回路辐照试验。在辐照温度1000℃、累积快中子注量 $1.28 \times 10^{25} \text{m}^{-2}$ 和燃耗(以金属铀计)达到 $95 \text{GW} \cdot \text{d} \cdot \text{t}^{-1}$ 时,包覆燃料颗粒的放射性裂变产物 ^{85}Kr 的释放率为 1.02×10^{-6} ,辐照后检验未发现包覆燃料颗粒破损。辐照考验结果表明,包覆燃料颗粒的性能可以满足我国10MW高温气冷堆安全运行的要求。

关键词 [高温气冷堆](#) [包覆燃料颗粒](#) [辐照](#) [辐照后检验](#)

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Irradiation Test of the Coated Fuel Particle for 10 MW High Temperature Gas-Cooled Reactor

ZHU Jun-guo, YANG Bing, TANG Chun-he, ZHANG Bing-zhong, SHAO You-lin, XU Shi-jiang (Institute of Nuclear and New Energy Technology, Tsinghua University, Beijing 102201, China)

Abstract The TRISO type coated fuel particle consists of a microspherical fuel kernel and coating layers of porous pyrolytic carbon, inner dense pyrolytic carbon, pyrolytic silicon carbide and outer dense pyrolytic carbon. On the basis of cold qualification test, the irradiation tests (closed capsule and sweep loop rig) of the coated fuel particles for 10 MW high temperature gas-cooled reactor (HTR-10) were carried out. When the irradiation temperature is 1 000 °C, and the maximum burnup and fast neutron fluence reach $95 \text{GW} \cdot \text{d} \cdot \text{t}^{-1}(\text{U})$ and $1.28 \times 10^{25} \text{m}^{-2}$, respectively, the release rate of the fission gas ^{85}Kr from coated fuel particles is 1.02×10^{-6} . The post-irradiation examination (PIE) confirms that the coated particles did not fail. The result of irradiation test shows that the properties of coated fuel particles can meet the design specification (safety operating) of HTR-10.

Key words [high temperature gas-cooled reactor](#) [coated fuel particles](#) [irradiation testing](#) [post-irradiation examination](#)

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