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加速器驱动系统的燃料选择

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摘要 对装载不同增殖材料的现实加速器驱动系统(ADS)的安全及嬗变超铀核素特性进行研究。分别以(U, TRU)O₂和(Th, TRU)O₂作为堆芯燃料,先用LAHET和MCNP程序对ADS进行稳态模拟计算,再耦合MCNP和ORIGEN2程序计算燃耗过程中的核素密度变化。结果显示,装载钍基燃料的

ADS对超铀核素的嬗变效果较好,且在燃耗过程中其反应性和质子流强波动较小;装载铀基燃料的ADS则具有更安全的多普勒效应和缓发中子有效份额。总体来看,如果需要堆长时间安全嬗变超铀核素,装载钍基燃料会取得更好的效果。

关键词 [加速器驱动系统](#) [安全](#) [反应性](#) [超铀核素嬗变](#)

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Fuel Choice of Accelerator Driven Systems

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Abstract The safety and transmutation characteristics of realistic designs of accelerator-driven sub-critical systems (ADS) with various fertile materials were investigated. Either (U,TRU)O₂ or (Th,TRU)O₂ was loaded in the core. Then the reactor calculations of ADS in steady state were studied using LAHET and MCNP programs, and the coupling system of MCNP and ORIGEN2 was used to calculate the nuclide density evolution with burnup. The results show that ADS loaded with thorium based fuel has the superiority in terms of TRU burning capability, beam current fluctuation, reactivity swing while the other one loaded with uranium based fuel does in terms of the effective delayed neutron fraction and the Doppler effect. From the overall comparison, a core loaded with thorium based fuel is concluded to be better in achieving a long life while maintaining safety and minimizing waste.

Key words [accelerator-driven sub-critical system](#) [safety](#) [reactivity](#) [transmutation](#)

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