

反应堆工程

## 次临界能源堆物理性能初步分析

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**摘要** 次临界能源堆 (SER) 是由托卡马克聚变源驱动的聚变裂变混合堆。SER以天然铀为燃料、水为冷却剂, 主要目标是生产电能。本工作建立了次临界能源堆环形圆柱模型, 利用蒙特卡罗输运和燃耗计算程序, 比较了燃料区不同构型对 $k_{\text{eff}}$ 、 $M$ 、TBR和燃料增殖比等参数的影响, 针对均匀模型进行中子源效率与聚变源强、功率分布与能谱、初步燃耗、寿期末停堆衰变热和卸载燃料放射性等物理性能分析。计算结果表明, 该模型能满足能量倍增大于6、氚自持、较长时间不换料等设计目标。研究结果为下一步开展SER安全分析提供了基础。

关键词 [次临界能源堆](#) [包层模型](#) [物理性能](#)

分类号

## Preliminary Physical Performance Analysis of Subcritical Energy Reactor

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**Abstract** The subcritical energy reactor (SER) is a fusion-fission hybrid reactor which is driven by Tokamak fusion source. SER uses natural uranium and water coolant. Its main object is to produce power. SER models with annulus cylinder were established. With Monte-Carlo transport and burnup codes, models with different fuel zone configurations were compared, the neutron source efficiency and fusion neutron source rate, power distribution and neutron spectrum, primary burnup, decay heat at the ending of life (EOL) and radioactivity of discharged fuel were calculated. The results show that the models can meet the design objects, that energy multiplication factor is bigger than 6, tritium is self-sufficient, the fuels are reloaded in a long time, and so on. The results provide the basis of SER safety analysis which will be done in the future.

**Key words** [subcritical](#) [energy](#) [reactor](#) [blanket](#) [model](#) [physical](#) [performance](#)

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