

快报

# 中国ITER固态实验包层模块活化特性计算分析

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**摘要** 基于中国ITER氦冷固态实验包层(HCSB-TBM) 3×6 模块化结构设计, 对其活化特性进行了计算分析。利用蒙特卡罗程序MCNP及数据库FENDL/2进行三维中子输运计算, 在此基础上, 使用欧洲活化分析系统EASY-2007进行了详细的活化计算。结果表明, 刚停堆时, 测试包层模块(TBM)总活度为 $1.29 \times 10^{16}$  Bq, 总余热为2.46 kW, 且均主要受低活化马氏体钢Eurofer材料控制。活度和余热值均在TBM安全设计范围内, 且不会对环境造成显著影响。同时, 根据计算的接触剂量率可知, TBM中的活化材料均能采取远程操作实现循环再利用。活化计算结果表明, 当前的HCSB-TBM设计中子活化角度满足ITER安全设计需求。

**关键词** [活化](#); [氦冷固态实验包层模块](#); [MCNP程序](#); [FISPACT程序](#)

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## Activation Analysis of Chinese ITER Helium Cooled Solid Breeder Test Blanket Module

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**Abstract** based on the Chinese ITER helium cooled solid breeder (CH-HCSB) test blanket module (TBM) of the 3×6 sub-modules options, the activation characteristics of the TBM were calculated. Three-dimensional neutronic calculations were performed using the Monte-Carlo code MCNP and the nuclear data library FENDL/2. Furthermore, the activation calculations of HCSB-TBM were carried out with the European activation system EASY-2007. At shutdown the total activity is  $1.29 \times 10^{16}$  Bq, and the total afterheat is 2.46 kW. They are both dominated by the Eurofer steel. The activity and afterheat are both in the safe range of TBM design, and will not have a great impact on the environment. Meanwhile, on basis of the calculated contact dose rate, the activated materials can be re-used following the remote handling recycling options. The activation results demonstrate that the current HCSB-TBM design can satisfy the ITER safety design requirements from the activation point of view.

**Key words** [activation](#); [helium cooled solid breeder test blanket module](#); [MCNP code](#); [FISPACT code](#)

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