原子能科学技术 2008 42 (12): 1077-1081 ISSN: 1000-6931 CN: 11-2044/TL

物理

内充气正比计数管测量^{37}Ar活度中壁效应的理论研究

曹琳，亢武，向永春，储诚胜

中国工程物理研究院 核物理与化学研究所，四川 绵阳 621900

收稿日期 2007-8-11 修回日期 2007-10-20 网络版发布日期: 2008-12-20

摘要 通过分析^{37}Ar衰变产生的X射线和俄歇电子在内充气正比计数管灵敏体积中的逃逸及计数管在^{37}Ar活度测量中的壁效应，得出X射线在正比计数管中的逃逸是产生壁效应的主要原因，提出了压力指数外推方法。使用MCNP模拟X射线和俄歇电子在内充气正比计数管中的输运，模拟结果与理论分析结论一致。比较模拟得出的壁效应值与实验测量的壁效应值可知，实验给出的壁效应值是可信的。本工作的研究结果为37Ar测量方法提供了理论支持。

关键词 ^{37}Ar；内充气正比计数管；探测效率；壁效应；MCNP程序

分类号 TL811.2

Wall Effect of Internal Gas Proportional Counter in ^{37}Ar Activity Measurement

CAO Lin, KANG Wu, XIANG Yong-chun, CHU Cheng-sheng

China Academy of Engineering Physics, P.O. 919-214, Mianyang 621900, China

Abstract

By analyzing the escape of X-ray and Auger electron generated by 37Ar, wall effect of internal gas proportional counter in 37Ar activity measurement was studied theoretically. Escape of X-ray is the main reason for wall effect of internal gas proportional counter in 37Ar activity measurement. Thus, the exponential extrapolation method of pressure was proved correctly. X-ray and electron transport in proportional counter was simulated by MCNP, and the simulation result accords with theory analytic result. The value of the wall effect was calculated by MCNP, and it is close to experimental result. This work offers theory support for 37Ar detection.

Key words

^{37}Ar _ internal gas proportional counter _ detection efficiency _ wall effect _ MCNP code

DOI

通讯作者