

物理

^{239}Pa 的鉴别及其特性

袁双贵, 丁华杰, 徐岩冰, 杨维凡

中国科学院 近代物理研究所, 甘肃 兰州 730000

收稿日期 2008-6-26 修回日期 2008-7-10 网络版发布日期: 2008-9-20

摘要 利用60 MeV/u ^{18}O 离子束轰击天然铀靶, 经多核子转移反应生成重丰中子核素 ^{239}Pa 。用放射化学方法从被照射的靶中分离出镤。借助于 ^{239}Pa 和它的子体 ^{239}U 的 γ 射线观测和分析, 鉴别了 ^{239}Pa , 测得 ^{239}Pa 的半衰期为(106±30) min。长寿命同位素, 如 ^{232}Th 和 ^{238}U , 可给出一个测定核合成持续时间的可能性, 而中等寿命同位素, 如 ^{235}U , 则可给出有关产生函数时间历史的信息。总地说来, 通过 $^{232}\text{Th}/^{238}\text{U}$ 、 $^{235}\text{U}/^{238}\text{U}$ 或 $^{244}\text{Pu}/^{238}\text{U}$ 的比率, 用公式 $N_A(\Delta)/N_B(\Delta) = (P_A/P_B)f(\lambda_A, \lambda_B, S_0, \lambda_R, \Delta)$ 便可推导出宇宙年龄。由 ^{239}Pa 的衰变途径, 可简单叙述 ^{239}Pa 的异常长的半衰期对于宇宙年龄估计的影响。

关键词 [鉴别](#) [\$^{239}\text{Pa}\$](#) [宇宙年龄](#)分类号 [0571.324](#)

Identification and Characteristic of ^{239}Pa

YUAN Shuang-gui, DING Hua-jie, XU Yan-bing, YANG Wei-fan

Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou 730000, China

Abstract A nuclide ^{239}Pa was produced via a multinucleon transfer reaction by 60 MeV/u ^{18}O ions bombardment of natural uranium. Protactinium was radiochemically separated from the irradiated targets. ^{239}Pa has been identified by using observation and analysis of γ -rays of ^{239}Pa and ^{239}U as a daughter nucleus of ^{239}Pa . The half-life of ^{239}Pa was determined to be (106±30) min. Long lived isotopes like ^{232}Th and ^{238}U give a possibility of determining the duration of nucleosynthesis whereas intermediate lived nuclei like ^{235}U can give information about the time history of the production function. Generally the universe age is deduced through the ratios of the $^{232}\text{Th}/^{238}\text{U}$, $^{235}\text{U}/^{238}\text{U}$ or $^{244}\text{Pu}/^{238}\text{U}$ with formular $N_A(\Delta)/N_B(\Delta) = (P_A/P_B)f(\lambda_A, \lambda_B, S_0, \lambda_R, \Delta)$. The influence of the novel long half-life of ^{239}Pa on the universe age estimate is simply mentioned by ^{239}Pa decay path.

Key words [identify](#) [\$^{239}\text{Pa}\$](#) [universe](#) [age](#)

DOI

通讯作者

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [\[PDF全文\]\(700KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含“鉴别”的 相关文章](#)
- ▶ [本文作者相关文章](#)

- [袁双贵](#)
- [丁华杰](#)
- [徐岩冰](#)
- [杨维凡](#)