原子能科学技术 1989 23 (6): ISSN: 1000-6931 CN: 11-2044/TL

小型高分辨率~3He/~4He质谱计的离子光学

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收稿日期 1987-8-4 修回日期 网络版发布日期:

摘要 <正> 一、前言 地球上氦同位素组成有三个层次:地幔氦、地壳氦和大气氦。地幔氦是地球生成时保留下来的原生氦,~3He含量高,~3He/~4He比值约10~(-5);地壳氦是地壳中铀、钍等放射性元素蜕变过程中生成的,~3He/~4He比值约10~(-7)～10~(-8);大气氦是在地幔氦与地壳氦不断地向

关键词 质谱计 氦同位素地球化学 离子光学 象差修正 计算机辅助设计(CAD)

分类号

THE ION OPTICS OF A MINIATURE ~3He/~4He MASS SPECTROMETER OF HIGH RESOLUTION

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Abstract To measure the isotopic abundance ratio of ~3He and ~4He in samples by massspectrometers is an important detection mean for helium isotope geochemistryresearch. A symmetrically arranged tandem ~3He/~4He mass spectrometer is describedin the paper. The front stage, used to analyse ~3He (including HD and H_3) and~4He, is a homogeneous analysing magnet with a bending angle of 90° and abending radius of 6 cm. The end stage, used to analyse ~3He, HD and H_3, is anon-homogeneous analysing magnet with a bending angle of 180°, a bending radiusof 15 cm and a magnetic field gradient of 0.75. Because of the use of the non-zero second order coefficient β and curved entrance face of the later magnet foreliminating second order aberrations, the resolving power of the system is notablyimprbved, and theoretically reaches about 3800.

Key words Mass spectrometer Helium isotope geochemistry Ion optics Corriecton of aberrations Computer-aided design (CAD)

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