Detection limit of Os isotopic analysis for rock samples using Faraday cups equipped with 10^{13} Ω amplifiers by NTIMS

GUIQIN WANG[1, 2], JIFENG XU*[3]

[1] State Key Laboratory of Isotope Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences (CAS). Guangzhou 510640, China

[2] CAS Center for Excellence in Comparative Planetology, China

[3] China University of Geosciences. 100083 Beijing,China.

(*correspondence: jifengxu@cugb.edu.cn)

The determinations of the N(^{187}Os)/N(^{188}Os) ratios of six geological reference materials with a wide range of Os mass fractions (～0.004 – 13 ng/g) were measured using static Faraday cups (FCs) with 10^{13} Ω amplifiers by negative thermal ionization mass spectrometry. Our results show that the repeatability precision is 2 – 3 ‰ (RSD, N = 3), when taking ～1 g of BHVO-2 with 76 pg/g of Os mass fraction and ～2 g of BCR-2 with 21 pg/g of Os mass fraction for each sample, whether measured by static FCs with 10^{13} Ω amplifiers or by a peak-hopping method on a single SEM. The repeatability precision measured by static FCs with 10^{13} Ω amplifiers is 1 – 0.2‰ (RSD, N = 3) when taking ～1 g of BIR-2 with 350 pg/g of Os mass fraction, ～1 g of WGB-1 with 493 pg/g of Os mass fraction, or ～0.5 g of WPR-1 with 13.3 ng/g of Os mass fraction for each sample, which is much better than those measured by SEM. Instead, when taking ～2 g of AGV-2 with 4 pg/g Os mass fraction, the repeatability precision measured by the peak-hopping method on a single SEM is 3 – 4‰ (RSD, N = 3), which is better than those measured by the static FCs method with 10^{13} Ω amplifiers. Therefore, it is suggested that static FCs with 10^{13} Ω amplifiers may replace peak-hopping by SEM for analysing Os isotopic ratios when a geological sample is of over ～ 21 pg/g of Os mass fraction when taking 2 g sample amount. Of the six geological reference materials analyzed in this study, WPR-1 and BIR-1a are the most homogeneous with regard to the Os isotopic compositions (2 RSD of 0.59% and 0.49%, respectively) when sample sizes are within 0.5-1 g. Therefore, WPR-1 and BIR-1a are more suitable to serve as reference materials than the other four RMs for determining the Os isotopic composition in geological samples when the sample size is within 0.5-2 g.

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