A modified laser ablation-isotope ratio mass spectrometry method for in situ analysis of sulfur isotope composition of sulfides

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Abstract

Rationale: A novel laser ablation-isotope ratio mass spectrometry (LA-IRMS) method for *in situ* sulfur isotope analysis of sulfides has been developed. Instead of the *in situ* reaction applied by the traditional laser microprobe, the analyte gas preparation in this method is separated temporally and spatially from the laser ablation, resulting in improved precision and accuracy. **Methods:** Our LA-IRMS system combines an ultraviolet (UV) LA system, an elemental analyzer (EA), a custom-built cryogenic concentration system, a continuous-flow interface and an IRMS. The sulfide aerosol particles generated from LA were transferred by a helium carrier gas from the ablation cell into the reaction tube and were converted into SO_2. Then SO_2 was enriched in two cold traps and was finally introduced into the ion source of an IRMS through a continuous-flow interface. **Results:** We measured three synthetic and four natural sulfide reference materials to test the performance of this method. Precisions of ±0.25-±0.64n=5) for $\delta^{34}S$ values can be obtained at a spot size of 64˜80 μm. Measured values and their known true values for these sulfur isotope reference materials showed good linear relationship (R^2=0.998˜0.9995) with slope of approaching unity (1.0509˜1.1313). **Conclusions:** Data from the measurement of reference materials showed that the precision and accuracy of our method was satisfactory. This method is a powerful tool for *in situ* sulfur isotope measurement of sulfides, and can be further applied to *in situ* carbon and oxygen isotope analyses.

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