

Simultaneous measurement of sulfur and iron isotopes in pyrite using a femtosecond laser ablation system coupled with two multi-collector inductively coupled plasma mass spectrometers

LIE-WEN XIE¹, CHAO HUANG¹, YUE-HENG YANG¹, SHI-TOU WU¹, JIN-HUI YANG¹

¹ *State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, P. O. Box 9825, Beijing 100029, P. R. China.*

In the hydrothermal gold deposits, the S and Fe isotopic compositions of pyrite (FeS₂) can effectively trace the sources of ore-forming materials and detailed metallogenetic processes. However, the formation of sulfide deposits may have involved multiple stages. Consequently, applying bulk analytical methods to obtain S or Fe isotopic compositions of ores or minerals can be challenged. The existing in situ microanalyses techniques can analyze S or Fe isotopes, respectively, which may lead to the obtained S and Fe isotope compositions belonging to different mineralization stages. We herein report a femtosecond laser ablation system coupled with two MC-ICP-MSs to measure simultaneously S and Fe isotopes of pyrite using a single laser ablation. We applied the different distribution of ablated material between two MC-ICP-MSs (3:2, 3:1 and 5:1 for S and Fe isotopes analyses, respectively) to test if any obvious mass fractionation occurred during the aerosol being split. The results demonstrated that the splitting aerosol process did not produce obvious mass fractionation for S and Fe isotopes. The uncertainties are about 0.2‰ (2 s) for $\delta^{34}\text{S}$ and $\delta^{56}\text{Fe}$. The S and Fe isotopic compositions of four in-house reference material measured using our method were consistent with those obtained using other methods within an error of 2 s analytical uncertainties.