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Synthesized molybdenite reference materials for *in situ* molybdenum and sulfur isotope measurement using laser ablation MC-ICP-MS

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Analyzing sulfur (S) and molybdenum (Mo) isotope ratios in molybdenite, the most common sulfide mineral, is crucial for studying the genesis of ore deposits. However, it is necessary to prepare matrix-matched reference materials for molybdenite. In this study, we employed two different techniques, the high-temperature-high-pressure (HTHP) technique and the rapid hot-pressing technique, to synthesize molybdenite and assessed their suitability as reference materials for *in situ* Mo and S isotope analysis in molybdenite. The molybdenites synthesized through HTHP and rapid hot-pressing exhibit smooth surfaces and dense structures, making them suitable as reference materials for *in situ* Mo and S isotope analysis, respectively. These synthesized molybdenite exhibits a homogeneous Mo and S isotope compositions based on a large number of LA-MC-ICP-MS measurements. The mean $\delta^{98}Mo_{NIST\ SRM\ 3134}$ values of 0.70 ± 0.06‰ (n=4, 2SD) and 0.70 ± 0.05‰ (n=4, 2SD) determined by solution nebulization MC-ICP-MS are suggested as a recommended $\delta^{98}Mo/^{95}Mo$ value for Mo-H8 and Mo-P. The mean $\delta^{34}S_{V\text{-}CDT}$ values of -0.22 ± 0.10‰ (n=9, 2SD) determined by elemental analyzer isotope ratio mass spectrometry (EA-IRMS) is suggested as a recommended $\delta^{34}S/^{32}S$ value for Mo-H8 and Mo-P. Therefore, we recommend combining ultrafine powders with a high-temperature-high-pressure technique and/or rapid hot-pressing technique to synthesize reference materials for isotopic analysis of other minerals.