Lead isotope geochemistry and lead source in black rock series of early Cambrian from southeast Guizhou, China

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Geological Setting

The Lower Cambrian black shale sequence of the Niutitang Formation in southeast Guizhou China hosts a barite layer. The ore-bearing rock series is composed of black silicalite, carbonaceous shale interbedded with phosphorite, barite and carbonaceous shale in ascending sequence. The stratified main ore bodies, partially in lenticular form, are dominantly embodied in the silicalite and black shale of the lower section of the Niutitang Fm. of the early Cambrian.

Results and Discussion

Systematical samplings for Lead isotope were taken in the Dahebian barite deposit in Tianzhu County of Guizhou Province China. Samples of barite and black shale were analyzed using TRITON TI thermal ionization mass spectrometer (TIMS) in the State Key Lab for Mineral Deposits Research of Nanjing University.

Most lead isotope data from barite ore and black shale (host rock) are plotted on or around the extended line of upper crust (barite ore: $^{206}Pb/^{204}Pb$=17.1494-18.7599, $^{207}Pb/^{204}Pb$=15.4855-15.7065, $^{208}Pb/^{204}Pb$=37.3690-38.1903; black shale: $^{206}Pb/^{204}Pb$=17.9707-18.8165,$^{207}Pb/^{204}Pb$=15.6743-15.7212, $^{208}Pb/^{204}Pb$=38.0255-38.2945), indicating an isogenetic origin. On the other hand, obvious isotopic differences between barite ore and Precambrian are observed, suggesting their different sources of lead isotopes. Based on the isotopic characteristics of barite, it can be concluded that the lead source of the barite deposits covers the upper crust, (including the upper crust mixed subduction zone), the mantle and the submarine hydrothermal sediments as well. Therefore, the Pb isotopic characteristics can be taken as an evidence for the submarine hydrothermal exhalative genesis of Dahebian barite deposits.

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