Geochemical characteristics of REE in the 8# ore-body of Shifengshan copper deposit, Yimen, Yunnan, China

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Tested with ICP-MS method, samples include fault tectonites, ore-hosted rocks and ores. Rocks are the purple sandy slate rocks (MP), gray pelitic-tuffaceous dolomite rocks (MG), gray silicified dolomite rocks (DL) and black-blue siliceous-strip dolomite rocks (DM).

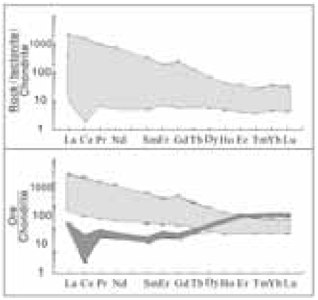

Figure 1: REE distribution models.

The REE distribution models include four types: 1) The model of MP and MG rocks, tectonites and ores belongs to high ∑REE - depleted Eu - enriched light REE type; 2) The model of DL and DM rocks shows low ∑REE - strongly depleted Ce - slightly depleted Eu - enriched light REE; 3) The model of tectonites of the NE-trending ore-bearing faults shows low ∑REE-enriched Eu and light REE; 4) The model of very low ∑REE - strongly depleted Ce – enriched Eu and heavy REE means the superposed ore-forming process of biotite monzonite veins. The origin of Cu and REE were from the MP and MG rocks of the diapir; The REE distribution models of tectonites and ores have high similarity (inheritance) with the diapir models. The ore-forming process occured along the contact zones among the diapirs and DL (DM) rocks. The biotite monzonite veins intruded along the NE-trending fault zones, which formed the NE-trending calcite-quartz-chalcopyrite veins in the early-formed ore-bodies. The REE characteristics show the NW-trending faults formed earlier than the NE-trending ones which strongly reformed the MP and MG rocks. The NW-trending faults were the ore-leading structures, the EW-trending faults were the distribution structures, and the NE-trending faults were the distribution and ore-hosted structures.

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The theoretical basis for ACE, an age calculation engine for cosmogenic nuclides

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ACE (formerly known as iCronus) is an integrated development environment for cosmogenic nuclide dating. By default it can be used for ^{3}He, ^{10}Be, ^{14}C, ^{21}Ne, ^{26}Al and ^{36}Cl samples, but is designed to be flexible enough to include other cosmogenic nuclides. Throughout the development process ACE employs a two stage calibration/dating algorithm so that production rates used to date samples are theoretically consistent with independently dated calibration samples. To account for temporal changes in cosmogenic nuclide production rates, the algorithm explicitly solves the buildup differential equation for inventory evolution at each time step using a temporal finite-difference scheme. By default, changes in production rates due to secular variability in the geomagnetic and atmospheric attenuation of cosmic rays are incorporated, with General Circulation Model reanalysis data used to account for the spatial variability in atmospheric shielding. All components of the calibration/dating algorithm are customizable and the modular design of ACE allows swapping of key theoretical components, so that sensitivities of computed ages to assumptions in experimental design can be assessed. For a range of real and synthetic data we use ACE to show the hierarchy of sensitivity of computed ages to current uncertainties in the theory of cosmogenic nuclide dating. Examples include the choice of atmospheric scaling, muogenic production rates, secular variability in paleoclimatic, and geomagnetic data and calibration datasets, and computations of low-energy neutron intensities.