SEG 2017 Conference

Mo mineralization in Xing'an-Mongolian Orogen and adjacent region: Contribution from dehydration melting of subduction-modified magma sources

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The juvenile Xing'an-Mongolian Orogen (XMO) is located between the Siberia Craton and the North China Craton (NCC). There are two Mo mineralization belts, the north Mo belt in the XMO and the south Mo belt in the north margin of the NCC. The two Mo belts share similarities in their deposits assemblages, geochemistry of ore-forming magma, and both have Mo deposits that are between ca. 245 and 130 Ma. The two Mo belts contain high F-type Mo mineralization like the Climax-type in Colorado, and have highly evolved Mo-bearing plutons like the Climax type granite with differentiation indices of ≥92. On these observations, the two Mo mineralized belts share the same genetic processes, and constitute an integrated belt. Geochemical comparative studies of Paleozoic Cu-bearing, Mesozoic Mo-bearing and Triassic alkaline plutons in both belts indicate that they are genetically similar with the mineralization associated with dehydration melting. This is different from Cenozoic alkali volcanics and peridotite xenoliths in the two belts with no evidence for dehydration melting. We propose that the source region for the Mo-bearing granites in the southern belt is the Proterozoic SCLM, which was metasomatized and re-fertilized in metals during the southward subduction of the Paleo-Asian plate. The Mo-bearing granite source in the northern belt is juvenile and fertile lithosphere formed by the northward subduction of the Paleo-Asian oceanic plate. Sr isotope data from these granites in both belts indicate they were generated from source regions with very low Rb/Sr ratios and were subsequently contaminated by magma with high Rb/Sr ratios in the upper crust. The Mo-bearing granites have positive $\varepsilon Nd_{(i)}$ values in the northern belt and negative $\varepsilon Nd_{(i)}$ values in the southern belt, which makes them distinct from each other. However, their Sm/Nd ratios are virtually the same averaging around 0.18, consistent with accumulation of radioactive Nd isotopes in both belts since the Triassic. The isotopes further indicate that differences in initial Nd isotope values of the plutons in the belts are inherited from their source regions prior being enriched in Mo, masking the genetic relationship between them. Based on the spatial and temporal distribution of Mo, geochemistry and Sr-Nd isotopes of the Mo-bearing granites, the Mo source region is the SCLM, which was enriched in metals, LILEs and water during subduction of the Paleozoic ocean resulting in chemical and lithospheric instability of the SCLM. Dehydration melting of the SCLM lead to the release metals and water during the Mesozoic when subduction was followed by extensional tectonics until the SCLM becomes barren at ca. 130 Ma when mineral deposition ceased.