POSSIBLE MAGMA AND METAL SOURCES OF PORPHYRY Mo-Cu DEPOSITS FROM EASTERN TRANSBAIKALIA (RUSSIA)

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Southern Siberia (Russia) is a part of the Central Asian Orogenic Belt, it accommodates a series of porphyry-type Mo-rich (Cu) deposits. Among them there are the Zhireken and Shakhtama deposits in Eastern Transbaikalia (Fig. 1A). The occurrence of porphyry Cu-Mo mineralization in Eastern Transbaikalia is related to active processes in the interaction zone of the Siberian continent with the Mongol-Okhotsk (Pz_2–Mz) Ocean. The northern margin of Eastern Transbaikalia is regarded as an active continental margin related to northward subduction of the Mongol-Okhotsk Ocean plate under the Siberian continent during Late Triassic-Middle Jurassic time. The ocean closed in the Middle-Late Jurassic as a result of the collision of the Siberian and Khingan-Bureya continents. Collision was accompanied by calc-alkaline magmatism and formation of large barren Mesozoic granitic plutons, followed by the emplacement of post-collisional shallow level mineralized porphyritic intrusions.

$^{40}Ar/^{39}Ar$ age of the Zhireken plutonic rocks ranges from 188 to 168 Ma, the granitic porphyries have an age range from 164 to 158 Ma. Shakhtama pluton has been dated from 202 to 167 Ma and porphyritic stock from 160 to 150 Ma. The Re-Os age for molybdenite samples has been dated at 163–162 Ma for Zhireken and 159–158 Ma for Shakhtama. The Zhireken deposit shows $(^{87}Sr/^{86}Sr)_0$ values of 0.70495–0.70642 indicating mantle-crust interaction, the Shakhtama deposit is dominated by a crustal source component with $(^{87}Sr/^{86}Sr)_0$ = 0.70741–0.70782.

S-Pb isotopic results together with Re-Os and $^{40}Ar/^{39}Ar$ isotopic dating indicate that the mineralization is genetically related to the emplacement of late orogenic post-collisional granitic porphyries. The sources of two magmatic systems – Zhireken and Shakhtama – were remarkably different with respect to the degree of crustal involvement in magma genesis. Pb isotope data show a linear trend in the plumbotectonic framework diagram ranging from radiogenic Pb at the Shakhtama deposit to mantle Pb at the Zhireken (Fig. 1B). The higher Pb-isotopic values for Shakhtama suggest an increasing involvement of crustal material in the source region. In both deposits Sr and Pb isotopic fingerprints show close values and narrow ranges for the ore-bearing porphyries and plutonic rocks in which the porphyries were emplaced, suggesting that they could have been generated from similar or the same source rocks. Lead isotope heterogeneity in the sulphides from Zhireken and Shakhtama indicates that not all Pb, and probably, other metals were deposited from one isotopically homogenous magmatic fluid. At least two sources of Pb with different isotopic compositions participated in the ore formation at Zhireken and Shakhtama. The Pb isotopic fingerprint of Cu-Fe sulphides (chalcopyrite from Shakhtama and pyrite from Zhireken) is consistent with a magmatic metal source. The more radiogenic Pb isotope compositions of molybdenite from both deposits are compatible with derivation of Pb from an external source.

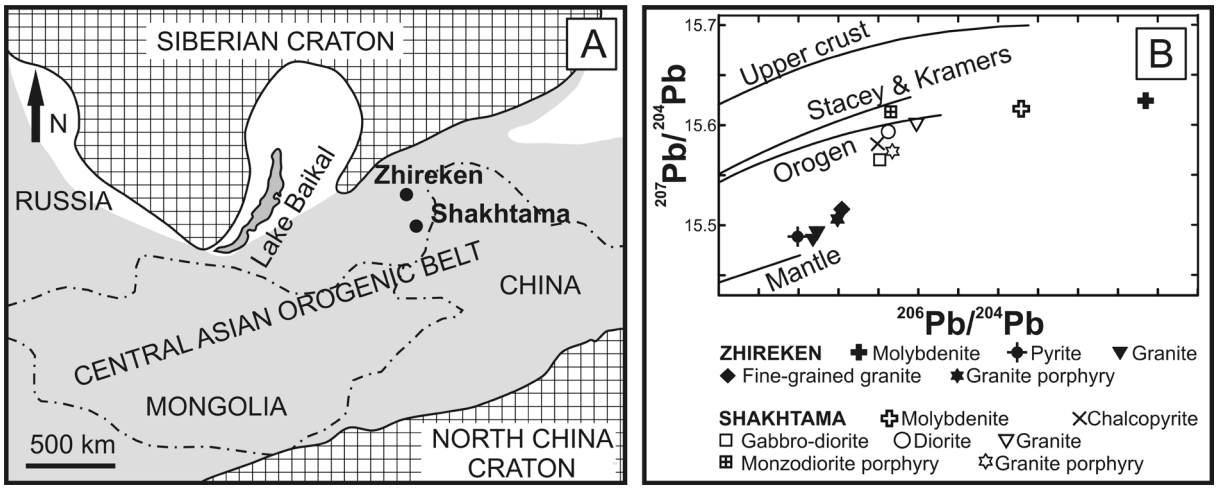

Fig. 1. (A) Location of the studied ore deposits within the Central Asian Orogenic Belt; (B) Lead isotope compositions of sulphides and rocks from the Zhireken and Shakhtama porphyry Mo-Cu deposits.