

Orogenic Kopylovskoe, Kavkaz, and Krasnoe black shale-hosted gold deposits, Siberia, Russia

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The Kopylovskoe (5.2 t Au), Kavkaz (5 t Au), and Krasnoe (34.5 t Au) deposits are located in the Lena gold province, within the Baikal orogenic belt, which also hosts the giant Sukhoi Log deposit (~3 000 t Au). The deposits are hosted in the Neoproterozoic Dogaldyn (Kopylovskoe and Kavkaz) and Vacha (Krasnoe) formations, which overlap the Khomolkho Formation with Sukhoi Log deposit. The host rocks of the deposits are mostly carbonaceous quartz-sericite-carbonate shales and sandstones metamorphosed under sericite and, locally, sericite-chlorite subfacies of the greenschist facies [1].

The $\delta^{18}\text{O}$ values of the veined quartz are similar for the Kopylovskoe (16.7–17.2 ‰), Kavkaz (17.7–18.7 ‰), Krasnoe (18.5–19.3 ‰), and Sukhoi Log (16–18 ‰ [2]) deposits and indicate the metamorphic source of the fluid [2]. Pb-Pb isotopic data [3] show a common geochemical type of the Pb source for these deposits, which by the Dow Zartman model can be identified as "crustal".

Three types of mineralization are distinguished in the deposits: (i) sulfide stringer-disseminated mineralization with veinlets concordant with host rock schistosity, (ii) carbonate-quartz veins, which cross-cut schistosity, and (iii) stockwork zones. Pyrite is the major ore mineral. Syn-sedimentary and diagenetic pyrite (Py1) is enriched in Au (up to 2.91 ppm), Ag (up to 61.56 ppm), and other chalcophile elements. In contrast, catagenic and/or metamorphic pyrite (Py2) has the lower but more variable contents of trace elements. It hosts inclusions of chalcopyrite, galena, gersdorffite, gold, and other minerals [1]. Native gold forms inclusions in Py2 and grains in quartz. The composition of gold varies from $\text{Au}_{0.90}\text{Ag}_{0.10}$ to $\text{Au}_{0.55}\text{Ag}_{0.45}$. Silver minerals include hessite, cervelleite, benleonardite, Ag sulphosalt, Cd-freibergite which were found only in the Krasnoe deposit.

Gold was formed during catagenesis and/or metamorphism. The carbonaceous host rocks were the source for gold.

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[1] Palenova *et al.* (2015) *Geol. Ore Deposit* **57** (1), 64-84.

[2] Dubinina *et al.* (2014) *Petrology* **22** (4), 329-358.

[3] Belogub *et al.* (2014) *Acta GeolSin-Engl* **88** (2), 252-253.