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Fe and Cu Isotope Compositions of Sulfides in Several Vein Gold Deposits, China

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Fe and Cu isotope data are useful in studying ore-forming process, including magma-fluid exolution, evolution, and source of ore-matierals, but papers on vein gold deposits were rare as of yet. Pyrite and chalcopyrite samples of vein gold deposits from the Xiaoqinling (XQL) in west Henan, the Dongping (DP) of north Hebei, and southern Altay were selected to analyze Fe and Cu isotope compositions in this study.

The pyrite samples were all collected from an earlier stage (pyrite-quartz stage) of studied deposits. The results show that the δ^{56}Fe values of pyrite in the XQL have a relatively narrow range varying from -0.026 to 0.409‰ (7 samples) for the Wenyu-Dongchuang gold deposit, and from 0.298 to 0.558 ‰ (3 samples) for the Dongtongyu deposit. The δ^{56}Fe values of pyrite from DP range from -0.010 to 0.255‰ (4 samples) with little variation, whereas those in the Sarekoubu (SR) gold deposit of southern Altay change remarkably from -0.498 to 0.759‰ (6 samples). The δ^{56}Fe values of chalcopyrite from SR deposit are from 0.393 to 0.417‰, and those from the Wulasigou (WL) deposit in southern Altay are from -0.175 to -0.122 ‰ (6 samples).

The δ^{56}Fe values of pyrite from vein gold deposits are mostly positive. These results are somewhat different from the δ^{56}Fe values of pyrite in the Jiaodong Peninsula of east NNC (Zhu and Jiang, 2018), especially for the pyrite in quartz veins (Linglong deposit), which has a lighter δ^{56}Fe range from -0.78 to 0.79‰ (16 samples). Combined with sulfide isotope compositon, it is suggested that the δ^{34}S of pyrite is somehow related to δ^{56}Fe. Different gold deposits have different areas in δ^{56}Fe vs δ^{34}S diagram (Fig.1).

The δ^{65}Cu values of chalcopyrite in later stages (polymetallic sulfides and dark grey quartz stage) from the Sarekoubu gold deposit have a narrow range, which are from -0.280 to 0.922‰ (5 samples) with error ranges of 0.02-0.06‰ (2SD). The δ^{65}Cu values of chalcopyrite in late overprint gold-bearing quartz veins have a narrow δ^{65}Cu range, from -0.14 to -0.02‰ for the adjacent Tiemurte Pb-Zn-Cu deposit and from 0.149 to 0.169‰ for the Wulasigou Cu-Zn-Pb deposit. These results show that gold mineralization in southern Altay is different from that of VMS/SEDEX which have a wide range of δ^{65}Cu values (Fig.2).

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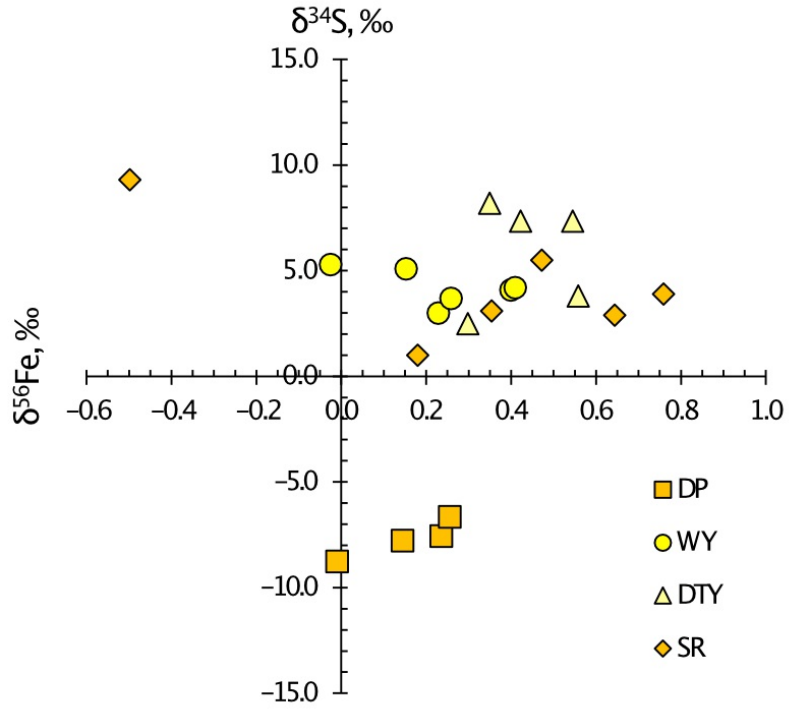

Fig.1 δ56Fe vs δ34S diagram of several vein gold deposits

DP–Dongping gold deposit in north Hebei province, China; WY–Wenyu–Dongchuang gold deposit in Xiaoqinling, west Henan, China; DTY–Dongtongyu gold deposit in Xiaoqinling; SR–Sarekoubu gold deposit in southern Altay, China

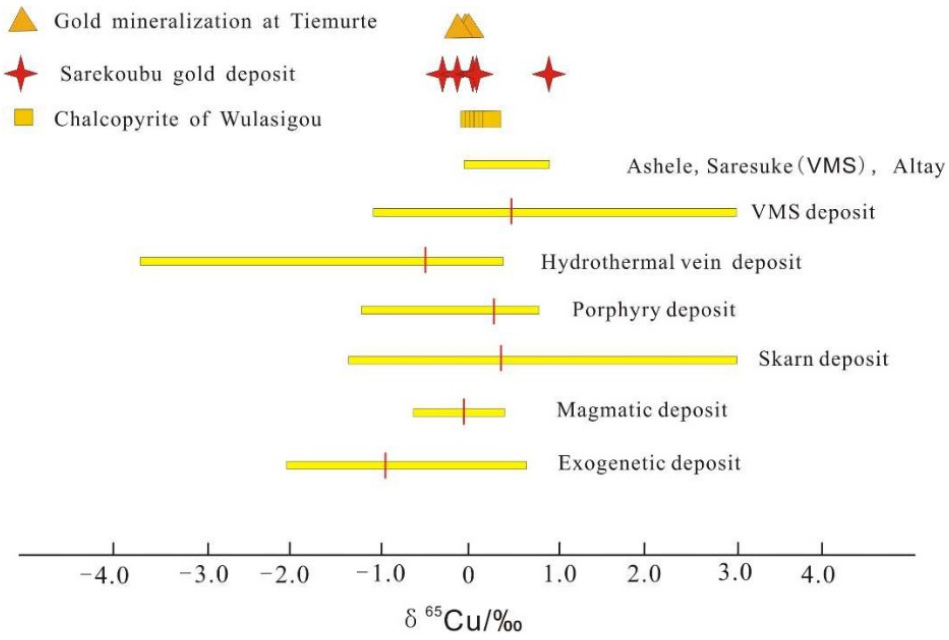

Fig.2 Comparison of Cu isotope composition of chalcopyrite in gold mineralization at southern Altay with some other ore deposits

(Modified after Wang and Zhu., 2010; Data of Altay are our unpublished work)