The Chahe Copper Deposit
—Its Age and Genesis

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Abstract: The Chahe copper deposit occurs in the Early Proterozoic metamorphic series in the area of Chahe and its chalcopyrite yielded a Pb-Pb isochron age of 951±36 Ma, providing evidence for copper mineralization at the early stage of the Jinning movement. The ore-forming material came from terrestrial clastic sediments and marine volcanic eruption and the ores were deposited in a relatively open beach environment. The Jinning movement led to folding and metamorphism of country strata, as well as to the rebomilization and transport of copper, resulting in ore deposition in structurally weak locations. This deposit is a volcano-sedimentary metamorphic deposit.

Key words: Chahe copper deposit; ore-forming epoch; volcano-sedimentary metamorphic deposit

Geological Setting

The Chahe copper deposit is located in Qinglongchang, Yuanjiang County, Yunnan Province. Geotectonically, it is situated on the north side of the Honghe deep fault and at the southern terminal of the Kangdian earth’s axis. The host strata consist of the Chahe metamorphic series of the Early Proterozoic (Pt1ch), strike north-eastward and dip north-westward with a dipping angle of 10°~50°. Three formations and eight lithological units can be distinguished from the bottom upwards.

The Lower Formation (Pt1ch1)

(1) It is composed of plagioclase granulites intercalated with thin-layered hornblende schist, sericite quartz schist and chlorite schist. The rocks exhibit gneissose and augen structures and their protolyte belongs to intermediate-acid rocks.

The Middle Formation(Pt1ch2-5)

(2) This formation, also called the first volcano-sedimentary cycle, is made up of chlorite schist, hornblende schist, sericite quartz schist, meta-basic volcanic rocks with the spread of copper mineralization. (3) The thick-layered quartz sandstones, as the major ore-bearing rock,
are interbedded with meta-basic volcanic rocks and chlorite schists and exhibit blastoaleuritic and crumpled structures. The orebodies of commercial importance are composed of disseminated ores and quartz sulfide veins or lenses. The principal ore mineral is chalcopyrite, followed by pyrite, chalcocite, molybdenite, malachite, covellite, pseudomorphous hematite, etc. (4) Quartz sandstones are interbedded with sericite chlorite schists and dolomite marbles. (5) Banded dolomite marbles are interbedded with thin-layered sericite-chlorite schists.

The Upper Formation (Pt$_1$ch$_6$–8)

This formation, also called the second volcano-sedimentary cycle, is composed of (6) grayish-green to dark green meta-basic volcanic rocks and exhibit well-developed amygdaloidal structure, with gas porosity highly developed in plagioclase and chlorite. The matrix is composed of aphalitic Fe and Mg minerals. (7) Chlorite schists are interbedded with meta-basic volcanic rocks. (8) Sericite quartz schists constitute the eighth unit of the Chahe metamorphic series.

Metallogenic Epoch

Four chalcopyrite samples were selected from the ores in Pt$_1$ch$_3$ for Pb isotopic analysis. The Pb isotope compositional characteristics of the Chahe copper deposit are presented in Table 1 and shown in Fig.1.

![Fig. 1. Pb-Pb isochron of chalcopyrite](image1)

![Fig. 2. The chondrite-normalized REE distribution patterns in ores and wall rocks. 1. Wall rock: YC-5, YC-6, YC-7, YC-12, YC-15; 2 ore: YC-1 and YC-10.](image2)