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Research Advances

Discovery of Liquid Cryptoexplosive Breccia in the Pulang Porphyry Copper Deposit of Yunnan Province and its Prospecting Significance

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The Pulang porphyry copper deposit, located in the Gezan tectonic-magmatic arc and south of the Yidun island arc, southwest of Sanjiang metallogenic belt in Yunnan province, is a super-large porphyry copper deposit. During recent decades, the Pulang deposit has attracted wide attention among geologists both at home and abroad. Many previous researches have discussed its forming tectonic environment, genesis and metallogenic epoch. However, there is still debate about the existence of the cryptoexplosive breccia associated with intermediate-acidic porphyry in this deposit.

Detailed geological survey during this study discovered cryptoexplosive breccia and firstly confirmed its existence in Pulang. The cryptoexplosive breccia was discovered in the No. I prospecting pit of Pulang (Fig. 1), with its outcrop at an elevation of 3928 m. It is ore-bearing quartz monzonite porphyry (QMP), and its diameter is 3–5cm (Fig. 1a); it shows an irregular shape or inverted V shape on the whole, cemented with siliceous sulfide (Fig1. b). It is classified as cryptoexplosive collapse breccia.

A large number of high-precision data have suggested that the mineralization of the Pulang porphyry copper deposit was completed during (235±2.4)–(221.5±2.0) Ma. However, the K-Ar age of the potassium feldspar in the main orebody was 182±1.8 Ma, and some thus considered that the Pulang porphyry magma activity lasted for 10–

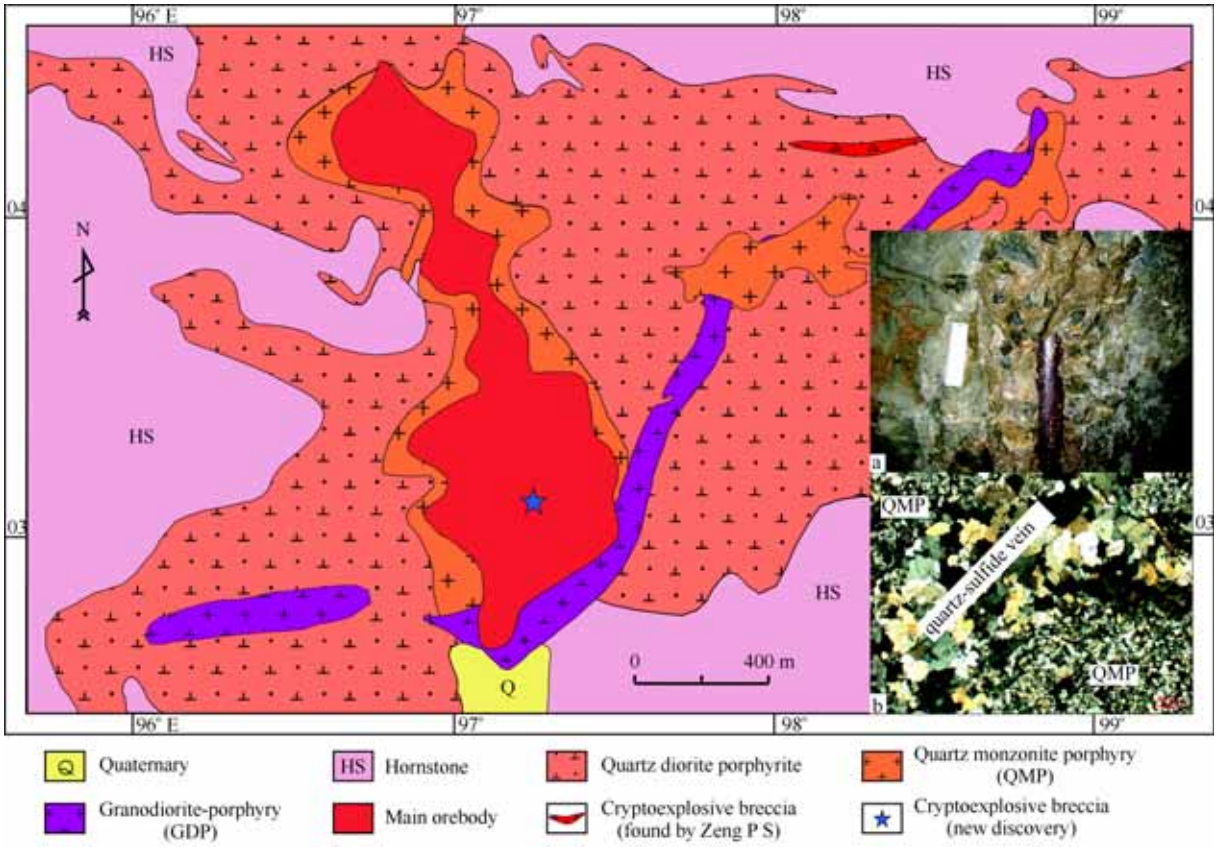

Fig. 1. Sketch geological map of the Pulang copper deposit inYunnan Province.

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40Ma. On the contrary, the typical porphyry copper metallogenic model suggests the duration of porphyry activist is very short, generally about 2 Ma. Moreover, some scholars suggested that the Pulang porphyry copper deposit experienced more than one geothermal event during 223.5–182.5Ma, and some researches suggested that Pulang still occurred similar Cu(Au) and Mo(Cu) mineralization at a deep level.

Exploration results reveal that the potential reserve of the Pulang copper deposit is about 5×10^6 t, and the orebody No. I (exploration lines 0–8) occupies more than 2/3 of the total reserve. In particular, the drillhole Zk0403 has a characteristic of full drillhole copper mineralization, with copper grade reaching up to as 0.7%, which is generally different from the low grade of the typical porphyry copper deposits. Thus, a single stage of mineralization due to one magmatic activity is difficult to form such a huge copper deposit.

It has have been suggested that, supergene acidic magmatic activities are usually accompanied by the occurrence of cryptoexplosive breccia, and its spatial relationship with the intrusion are mainly illustrated in two ways: underplating and lateral cryptoexplosion. The underplating cryptoexplosion usually occurs at the top of supergene acidic magma, and is associated with large hidden intrusion in the deep. In contrast, the lateral cryptoexplosive breccia generally contacts with the surrounding rock directly, and is not connected with intrusive rock in the deep. This type of cryptoexplosive breccia is also defined as “rootless breccia”, and the cryptoexplosive breccia reported by Zeng (2004) may belongs to this type.

The main No. I orebody in Pulang occurs at an elevation of 3868–4320 m level, with its controlled length of 1920 m and variable vertical thickness of 17–801 m. The cryptoexplosive breccia discovered in this study occurs at the altitude of 3928 m, and is located at the bottom of No I main orebody. It is different from the underplating cryptoexplosion and lateral cryptoexplosion of metallogenic quarzt monzonite porphyry (QMP). Thus, we propose that the cryptoexplosive breccia defined in this study should be generated by another magmatic event later than metallogenic quartz monzonite porphyry (QMP).This view further suggests a significant ore exploration prospect at deep level underneath the previous orebodies of the Pulang copper deposit, and the latter mineralization is crucial to forming such a huge and high-grade copper deposit.

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