Contributions of Ductile-brittle Deformation to Gold Mineralization in the Hetai Gold Deposit

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1 Introduction

The Hetai gold deposit (HGD) which is a typical ore deposit controlled by ductile shear zones, is the largest gold deposit in Western Guangdong and southeastern Guangxi. About the metallogenic epoch, it can be divided into mineralization during ductile process (Wang et al., 1989; Chen et al., 1993; He et al., 1993; Yao, 1995; Zhai et al., 2006; Zhu et al., 2011) and mineralization during brittle process (Wang et al., 1989; He et al., 1993; Chen et al., 1993; Zhang et al., 2001; Zhai et al., 2006). Now it is still lack of beneficial discussion on gold mineralization during brittle-ductile process in the HGD. A large number of studies show that, brittle-ductile deformation process is favorable for gold mineralization (Robert et al., 1986; Richard et al., 1988; Boullier et al., 1992). How about the mineralization during brittle-ductile process in the HGD? In order to discuss this question, distribution characteristics of lentoid silicalites and the relationship between lentoid silicalites and Au orebodies are observed under the shaft and by microscope.

2 Geologic Character of the HGD

The bearing strata of the HGD is the Sinian Yunkai group. The ore-hosting rocks are mainly mica-quartz schist, quartz-mica schist, and mica quartzite. The fault F1 in the southeast of the mining area is one of the main boundary structures. The fault dips NW; the dip angle is 55–70°. Ore-bearing structures are mylonitization zones and host brittle fractures within them. The shape of mylonites in plane view is a long narrow belts striking E52°–72° N and dipping to NW. They are locally overturned and their dip angles are 50–80°. They generally extend about 500–1000 m long along strike. Their width ranges from tens of centimeters to tens of meters. The largest one is longer than 2600 m with a width of 40m. There is not a distinctive boundary between mylonite zones and their host rocks. From the contact to the center, the fracture density increases. Plagioclase-bearing granites cropped out to the southwest of the mining area, while biotite adamellite crop out to the northeast. The gold ore belt is in a sinistral distribution in the Hetai area, such as Yunxi, Gaocun, and Houjing. The thickness of ore veins ranges from centimeters to tens of meters. The strike of the ore veins are between N60–80°E and dip NW, with a dip angle of around 70°.

3 Contributions of Ductile-brittle Deformation to Gold Mineralization

By observing under the shaft, it is discovered that quartz veins containing gold, pyrite and quartz always spasmodically fill along the mylonitic foliations and appear as lentoid silicalites (Fig.1a). Filling characteristics under the shaft and the phenomenon of dynamic recrystallization from fractography (Fig.1b), indicate lentoid silicalites formed in the process of brittle-ductile shearing. The suitable temperature (250–350°C), pressure reducing, reduction environment, fluid mixing and abundant content of CO2 in the process of brittle-ductile shearing are the favorable conditions for gold mineralization. Observation of microscope and hand specimen show silicated mylonites formed in the process of brittle-ductile shearing have much more brittle fractures than un-silicated mylonites, which provides a lot of host structures for auriferous hydrothermal after brittle fractures. Auriferous sulfides filling in the brittle fractures of silicated mylonites, combined with fine anhedral grain.
characteristics of auriferous quartz and auriferous pyrite, and drastic pressure reducing and boiling characteristics of fluid inclusions, indicate the formation process of brittle fractures accompanied with pumping and pressure reducing boiling.

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References


