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The Re-Os Isotope Geochronology of Dapai Iron Polymetallic Ore Deposit in Yongding County, Fujian Province and its Genetic Significance

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The Dapai iron polymetallic ore deposit in Yongding country of Fujian province is located in the southern margin of the Southwestern Fujian depression belt, where unique tectonic environments have produced favorable ore-forming geological conditions. It is formed by a set of carbonate rocks and coal-bearing clastic rock sediments of late Paleozoic hosting iron, lead and zinc polymetallic ore deposits and a large number of intrusive granite magma of late Mesozoic. The Makeng type iron deposits mainly occurred in the middle and upper carboniferous to lower permian carbonate formation, around where we can also see the late Mesozoic granite rock bodies. The genesis of Makeng type iron deposits has long been disputed, which include the submarine volcanic eruption (exhalation) of late Paleozoic-superimposed reformation and the strata bound skarn which are related to the Mesozoic granitic magmatic and carbonate rocks. To explore the genesis of the Makeng type iron deposits, It is necessary to do a comparative study of the metallogenic epoch and the relevant magmatism age. The Dapai iron polymetallic ore deposit is newly discovered, it has the characteristics of the Makeng type iron deposits (Xu et al, 2008). Generally, the ore body is strata bound and it is associated with some intermediate-acid intrusive rocks. Therefore this paper selects the molybdenites from the iron ore body in the Dapai polymetallic ore deposits to develop the study of Re-Os isotope geochronology in order to discuss the relationship between the Mesozoic magmatism and iron polymetallic ore deposits mineralization.

1 The Geological Features of Ore Deposit

The Dapai iron polymetallic ore deposit is located in the core of The Longyan-Yongding multiple syncline of the southwestern Fujian depression belt. The iron orebody is mainly hosted in the middle and upper carboniferous-lower permian carbonate formation. Intrusive rocks are mainly intermediate-acid. The intrusive rocks, which is closely related to metallogeny, belong to a set of high-K calc-alkaline, metaluminous-weakly peraluminous, porphyroid medium-fine grained granite. Most of the ore body is hosted in middle-upper Carboniferous Chuanshan formation and lower Permian Qixia formation, also occurred in a series of shallow level thrusting nappe and interlayer denudational structural zone. The magnetite orebody and some associated molybdenite mineralization are distributed at the bottom of mining area while lead-zinc orebody located in the upper part. Between the two orebody, there are chalcopyrite orebody and polymetallic parts distributed in fragments. Magnetite, galena, sphalerite dominant the ore minerals, pyrite and chalcopyrite occurs as minor ore minerals and some localy associated molybdenite. Gangue minerals are garnet, diopsid, salite, calcite, epidote, chlorite, quarz and so on. The ores are mainly crystallization texture including subhedral-allotriomorphic granular texture, granuloblastic texture and some other metasomatism and filling texture. The ores are mainly massive structure, banding structure, laminated structure, disseminated structure and some veinlet structure. The deposit type is proposed to be strata bound skarn. It is implied that the ore-forming process should be divided into following four stages: skarn, quartz-sulfide, carbonate, epigenetic oxidation. Majority of magnetite orebody are hosted in skarn and its coexistence with garnet could be identified and intergrowth of molybdenite and skarn minerals has been recognized which implicate the possibility that magnetite and molybdenite of Dapai polymetallic ore deposit could be generated in the same period.

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2 Re-Os Isotopic Geochronological Characteristics of Molybdenite

Five sets of molybdenite extracted from drill ZK302 and ZK1102 have been chosen for Re-Os isotopic geochronological study with respect to the mutual relationship between magnetite and molybdenite. Test results shows that weighted average value of the five sets of molybdenite is 133 ± 2Ma and isochron age is 134. 8 ± 1.4Ma(figure 1). According to the fact that magnetite and molybdenite of Dapai polymetallic ore deposit could be coeval, it leads to that the formation age of Dapai iron polymetallic ore deposit is 133 ± 2Ma which is in early Cretaceous. The LA-ICP-MS zircon U-Pb isotopic dating indicates that the age of granite closely relating to ore-forming is (131.72 ± 0.41)-(132.35 ± 0.83)Ma resembling the age of molybdenite. Overall, it is suggesting that the genesis of Dapai iron polymetallic strata bound skarn deposit is closely related to the intrusion of the intermediate-acid granite in early Cretaceous.

3 Isotopic Chronology Geological Significance

"Makeng type"iron deposits has been controversial with regards to its genesis so far. Isotopic chronology studies on metallogenic epoch and related magmatism time have significantly progressed. The Re-Os isochron ages of the associated molybdenite in Makeng are (130.50±0.92)Ma (Wang. et al, 2010) and (133.0±1.9)-(134.0±4.2)Ma (Zhang. et al, 2012) respectively which are similar to the age of Juzhou pluton from zircon U-Pb isotopic dating (Mao. et al, 2006; Zhang. et al, 2012). The Re-Os isotope model age of molybdenite of Luoyan iron deposit in Zhangping is (133.0±1.9)-(134.0±4.2) Ma and the crystallizing ages of granite-porphyry and porphyritic fine-grained granite from ore area are 131±1 Ma,131.64±0.62 Ma, respectively (Zhang. et al, 2012). Combing the features of "Makeng type" iron deposits with the isotopic chronology characteristics of granite in south-western Fujian, we can draw a conclusion that in early Cretaceous there was an important and large scale iron-polymetallic mineralization with its related to intermediate-acid magma intrusion which is inseparably connected to the extensional setting of south china plate in early Cretaceous.

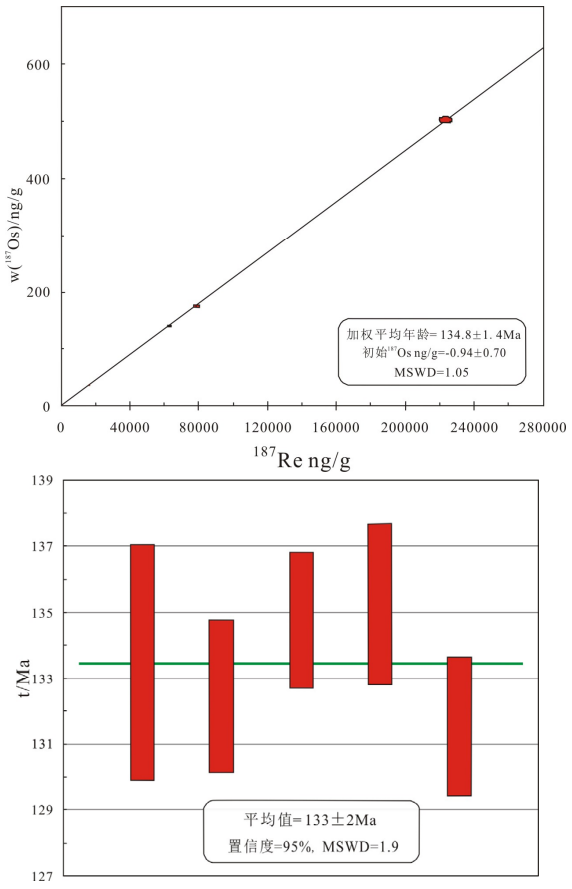

Fig.1. Re-Os isochronal line and weighted mean of molybdenite in Dapai lead-zinc polymetallic ore deposit.

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