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Characteristics of Makeng Iron Deposit in Southwestern Fujian Province, Implications for the Skarn Deposit of Magmatic Origin

MA Shuai, DI Yongjun, ZHANG Da, Vatuva ABSAI, YAN Pengcheng

China University of Geosciences, Beijing 100083,China

1 Introduction

Makeng iron deposit as one of the most important iron deposit in southwestern China, it has provided a typical model for several "Makeng" style polymetallic deposits discovered along the Wuyishan polymetallogenic belt.The magnetite as the major metallic mineral is hosted between the Lindi formation known as sandstone and Jinshe-Qixia formation known as limestone with Dayang and Juzhou granite distributing aside and diabase intruding in different time.The genesis of Makeng deposit has been controversial, three theories occupied a dominant position, which includes: (1) strata bound skarn deposit (2) Marine volcanic sedimentary and hydrothermal reformation; (3) Terrigenous sediments with post fluid re-working. Based on fieldwork, microscopic observation and geochemistry, we offer a new perspective about the genesis of Makeng iron deposit:a magmatic origin.

2 Field Characteristics of Makeng Deposit

The following characteristics of Makeng deposit can be recognized as implication for magmatic origin. (1) Magnetite always coexists with single skarn mineral eg. garnet or diopsite and the sharp boundary between ore and carbonate rocks can be observed underground which means barely no gradual change between skarn and marble. (2) A magnetite dike intrudes into marble with little alteration on the boundary margines. (3) Carbonite boulders within the magnetite ore like a xenolith assimilated by skarn magma. (4) Flow structures, it is visible that flowing direction parallels with the contact line of magnetite skarn and carbonite. Sometimes the vortex structure can be seen in the skarn which shows the typical flowing features of magma. (5) Because the physicochemical conditions change during the absorption of calcium from the limestone, felsic component segregates itself from the magma to form the quarz and feldspar which we also found within skarn.With the same reason cystic shape skarn made up by coarse-grain garnet can also be recognized, which regarded as the exclusive mechanism of magma as liquation.(6) Within the orebody, Magnetite content increases toward the footwall, implying that gravity sorting mechanism dominate in the ore-forming process which is not a characteristic of typical metasomatic skarn deposit.

3 Geochemical Features

Samples from Juzhou granite is characterized as low FeO,and features of calc-alkaline series.High concentration in Pb is obvious which implies that the granite in study area of crustal origin.Geochemical diagrams show that granite is product of intraplate setting. Diabase is enriched in LILE while depleted in HFSE with Pb peak indicating an arc setting and crustal material contamination. Considering the ability to carrying iron and comparison between granite and diabase for Eu anomalies,we relate skarn rocks to the diabase instead of granite. The magnetite grades of the orebody are sporadic, with respect to the distance from the granites.

4 Melt Inclusion and Magnetite

We have found large number of melt inclusions and fluid inclusions in garnet, pyroxene skarns and marble. The fluid inclusions homogenization temperatures are between 670℃-160℃, some of them reach to 745℃ and 830℃. Compering Microprobe data of magnetite to the standard magnetite, Makeng magnetite with less bulk composition contains more SiO_2. We propose that before the magma cools down, segregation of immiscible Fe-S-O melt took place and with the change in oxygen fugacity non-standard magnetite precipitates. All characteristics discussed above prefer being related with magma activity.

* Corresponding author. E-mail: mashuai_dd@126.com

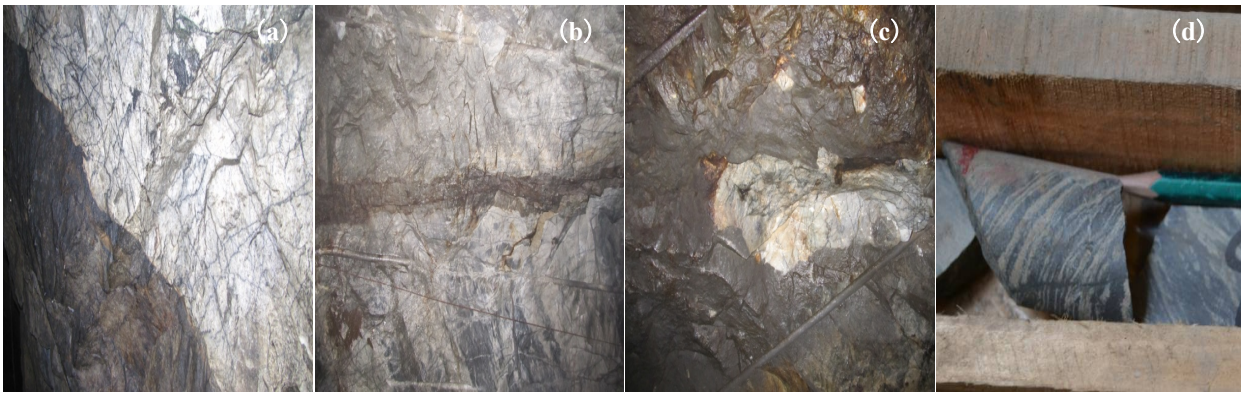

Fig.1 a:Sharp contact relationship between magnetite and marble; b:Magnetite intrudes into mareble c:Carbonite boulder is wrapped in the magnetite d:the flow structure of magnetite skarn rocks

5 Discussion

We offer a simple ore forming process model for Makeng iron ore: upper mantle magma intruded and assimilated the surrounding carbonite due to the depression activity. As oxygen fugacity and physcochemical conditions changed, iron oxides precipitated from magma forming the vertically zoned Makeng iron deposit under gravity sorting mechanism. The intrusion of skarn magma brought alteration to wall rocks including marbleization of limestone. Then Makeng area went though different tectonic movement.

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