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Geological Characteristics and Origin of the Hashitu Molybdenum Deposit, Inner Mongolia, China

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1 Geological Setting

The Hashitu molybdenum deposit is one of many large sized porphyry molybdenum deposits in Inner Mongolia, and the molybdenum grade of its ores is in a range of 0.08-0.36%, averaging 0.129%. It is located in Xinlin Town of Linxi County, Chifeng City, Inner Mongolia. its geographic coordinates are as follows: 44°03′30″-44°05′ 30″N and 117°58′00″-118°05′00″E. From the view point of tectonics, it is within a Late Paleozoic accretion orogenic belt between the West Lamulun River fault and the Hegenshan fault (suture) in the central-southern Da Hinggan Mountains(Nie et al., 2007; Ma et al., 2009).

Intrusions, especially Middle Hercynian to Late Yanshanian intrusions, are widespread in the ore district. And the Hercynian-Indosinian intrusive rocks are mainly a series of granodiorite that intruded into the Carboniferous strata. The Yanshanian intrusive rocks mainly include medium-fine grained porphyritic biotite granite, granite-porphyry, medium-grained moyite, and quartz monzonite porphyry, of which the medium-fine grained porphyritic biotite granite and granite-porphyry are the main host rocks of the Hashitu molybdenum deposit(Zhang et al. 2012).

2 Deposit Geology

The ore bodies of this deposit mainly appear in veined, layered, layer-like and lenticular shapes. Generally, they dip to northest, with dip angles of 50-70°. The lengths of them are 50-530m, averaging about 80m, and the thicknesses of them are 0.4-9m, averaging about 2m. These ore bodies can be divided into two types: type I occurs as thick beds and veins in wall fracture zones and has features of hydrothermal filling, while type II occurs as disseminated and stockwork or veinlet and has features of porphyry copper deposit mineralization.

The main ore minerals include molybdenite, wolframite, pyrite, chalcopyrite, pyrrhotite, and arsenopyrite, and main gangue minerals are quartz, K-feldspar, sericite, fluorite, chlorite, and epidote.

Alteration is intensive distributed in the wall rocks, a series of wall-rock alternations can be seen from the ore body to host rock, such as silication, greisenization, sericitization, argillation, and propylitization as well as a little fluoritizaion and epidotization. Of these alternations, silication and greisenization are the most significant and show the closest spatial relationship to molybdenum mineralization(Zhang et al. 2012).

3 Origin

The biotite granite and the granite-porphyry in Hashitu ore district have not only the same original magma, but also undergo the same rock-forming process. And the molybdenum mineralization should be the continuation of these magmatic activities. The diagenetic age of the granite-porphyry is 149.66±0.69Ma, and the metallogenic age of the Hashitu molybdenum deposit is a little younger than it. they both formed in the Yanshanian or the Late Jurassic.

The geological characteristics suggest that the genetic types of Hashitu molybdenum deposit should be a magmatic hydrothermal replacement deposit. And the metallogenic environment of the Hashitu molybdenum deposit should be a post-collision tensional tectonic environment(Fig1), the metallogenic material of it would come from the remelting of upper crust micro-blocks caused by the mantle upwelling(Fig2,3).

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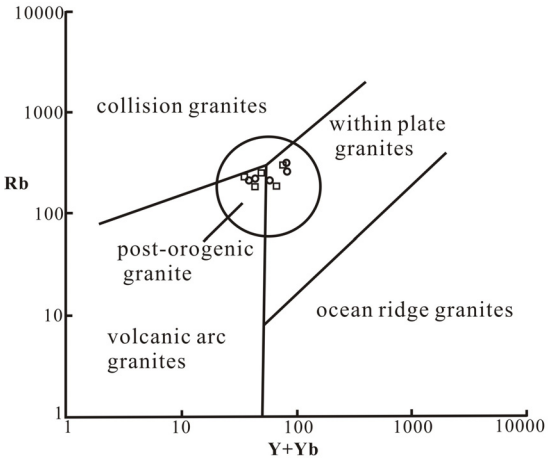

Fig. 1. Diagram of Rb vs Y+Nb based on test and analytical data of Sm-Nd isotopes of granite-porphyry and biotite granite in Hashitu (fields from Pearce et al., 1984; Forster et al., 1997).

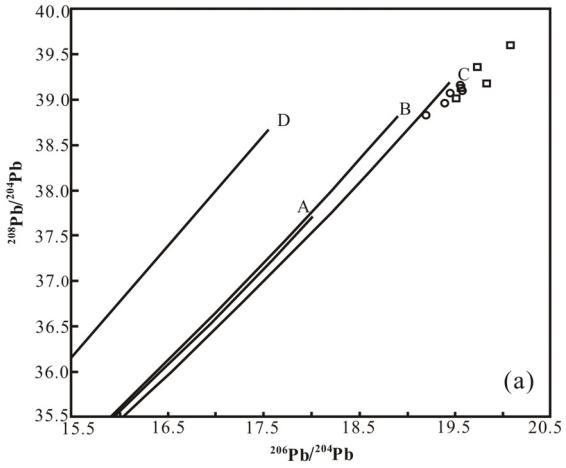

Fig. 2. Diagrams of $^{207}Pb/^{204}Pb$ vs $^{206}Pb/^{204}Pb$ based on test data of Pb-isotopes of granite-porphyry (circle) and biotite granite (block) in Hashitu (fields from Zartman and Doe, 1981).

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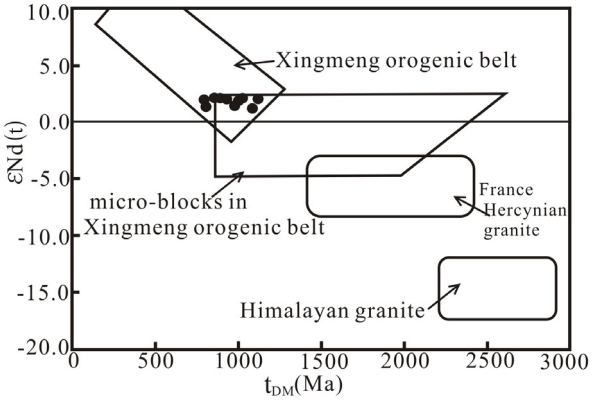

Fig. 3. Diagrams of εNd(t) vs t_{DM}(fields from Hong et al., 2000)based on analytical data of Sm-Nd isotopes of granite-porphyry and biotite granite in Hashitu.

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