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The geology and geochemistry of the Shizitou molybdenum deposit, Jiangxi province, China: Implications for the geodynamic setting

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1 Introduction

The Qin-Hang suture zone is the most important polymetallic metallogenic zone in southern China [1-2] and has the greatest resource potential. In recent years, a group of molybdenum (Mo) deposits have been discovered in the northeastern part of the Qin-Hang belt [3]. From Mar. 2006 to Dec. 2014, the Jiangxi Copper Group Geological Exploration Engineering Co., Ltd. conducted prospecting, preliminary exploration and detailed exploration in the Shizitou Mo deposit. The current reserves of the deposit have reached medium size. This paper attempts to characterize the timing of ore formation and the dynamic background of ore formation.

2 Mineralization age

The Re-Os model ages of the molybdenite fall within the range of 156.9±2.2 Ma-158.5±2.4 Ma, with a weighted mean of 158±1 Ma (MSWD=0.34). The ISOPLOT software package was used to perform isochron fitting using the data from the 5 molybdenite samples. The results show that the Re-Os isochron age is 158.0±2.5 Ma (MSWD=0.81), which is equivalent to the middle-late Jurassic metallogenic peak in southern China proposed by MAO et al. (2008).

3 Geodynamic setting

The Qin-Hang metallogenic belt is located within the South China block, which was located between the North China block and the Indosinian block during the Indosinian epoch. The three blocks collided and became integrated into a single plate between 240 and 220 Ma (Mao et al., 2008a). The pre-Jurassic tectonic evolution of southern China is mainly controlled by the Tethys tectonic system and the Indosinian compressional orogenic event (Xu et al., 2005). The South China block was subjected to far-field stresses that resulted from orogenic events that occurred along the southern and northern margins and subduction and accretion events (Mao et al., 2011). These events resulted in nearly N-S compression and thickening of the regional crust (Ren et al., 2000). Up to now, no Triassic Mo deposit has been found in southern China. However, MAO et al. (Mao et al., 2008b) argued that the Triassic W-Sn-Nb-Ta mineralization event (239-214 Ma) in the South China block is closely related to post-collisional intrusives primarily characterized as peraluminous two-mica granites, which are the product of re-melting of a thickened crust.

Since the Yanshanian, the South China block has occupied the juncture between the Pacific, the Paleo-Asian Ocean and the Tethyan tectonic domains (Xu, 2012) and has been subjected to stresses from all of these domains. The early Jurassic (205-180 Ma) marked a relatively calm period for the South China block, and this period featured limited volcanic activity and magmatic emplacement (Zhou et al., 2006). Maruyama & Seno (1986) and WAN (2002) concluded that the Izanagi block began to move NW and to subduct at a low angle beneath the Eurasian plate in the Jurassic. However, they were not able to precisely define the timing of subduction of the Izanagi plate. Based on the earliest mineralization age and the dynamic features, MAO et al. (2011) inferred that the Izanagi block subducted NW at a low angle beneath the Eurasia block at approximately 175 Ma. Due to the NW subduction of the Izanagi plate, the eastern continental margin of China became an active continental margin, and re-melting of the subducting plate occurred along the Qin-Hang paleo-suture zone. Simultaneously, the continental crust continued to thicken, and a group of NE-striking zones of lithospheric extension and deep faults developed in the back-arc zone. The development

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of bimodal volcanic-intrusive complexes (158-179 Ma; Chen et al., 2002), A-type granites and alkaline intrusive rocks (165-173 Ma; Li et al., 2003), and the low-t_{DM} and high-ε_{Nd} granite belt that extends from Hangzhou through Jiangxi and Hunan to Shiwanda Mountain all demonstrate that the northeastern section of the Qin-Hang metallogenic belt was a zone of lithospheric extension during the middle Jurassic (Gilder et al., 1996). The South China block experienced partial extension and thinning during the Mesozoic (Wang et al., 2012), triggering activity in the deep mantle and resulting in the upwelling and underplating of mantle-derived materials along fractures in the continental margin extension zone (Mao et al., 2013). In summary, all of the Mo deposits that formed at 172-145 Ma in the northeastern section of the Qin-Hang metallogenic belt developed within a dynamic back-arc partial extensional setting related to the low-angle subduction of the Izanagi plate beneath the Eurasian continent (Jiang et al., 2006; Mao et al., 2011).

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