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## Zircon U-Pb and Molybdenite Re-Os Dating of the Xitian W-Sn Polymetallic Deposit, Eastern Hunan Province, China and Its Geological Significance

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The Nanling Range, traversing Hunan Province, Guangdong Province, Guangxi Province and Jiangxi province, is about 10,000 Km by area. It's geologically located in the central part of South China and is the most important tungsten tin polymetallic province with large-scale W-Sn mineralization associated with the Yanshanian granites (Hsu, 1943; Mao et al., 2004; Suzuki et al., 1996). On the basis of data from USGS (2013), it accounts for more than 90% of the Chinese tungsten resource. Tens of large-scale W-Sn polymetallic deposits were distributed within the Nanling Range, such as the Shizhuyuan W-Sn-

Mo-Bi deposit, Furong Sn deposit, Yaogangxian W deposit, and Xintianling W-Mo deposit (Fig.1).

The Xitian deposit, situated in the Eastern Hunan province, is a recently discovered large-scale W-Sn deposit in the central Nanling metallogenetic province. It is also located along the Chaling-Chenzhou deep fault, which is a major deep regional structure associated with W-Sn deposits genetically related to Mesozoic granites (Fig. 1). The Xitian granite complex, hosting the W-Sn mineralization occurred during Mesozoic including Indosinian granites and Yanshanian granites. There are mainly three types of

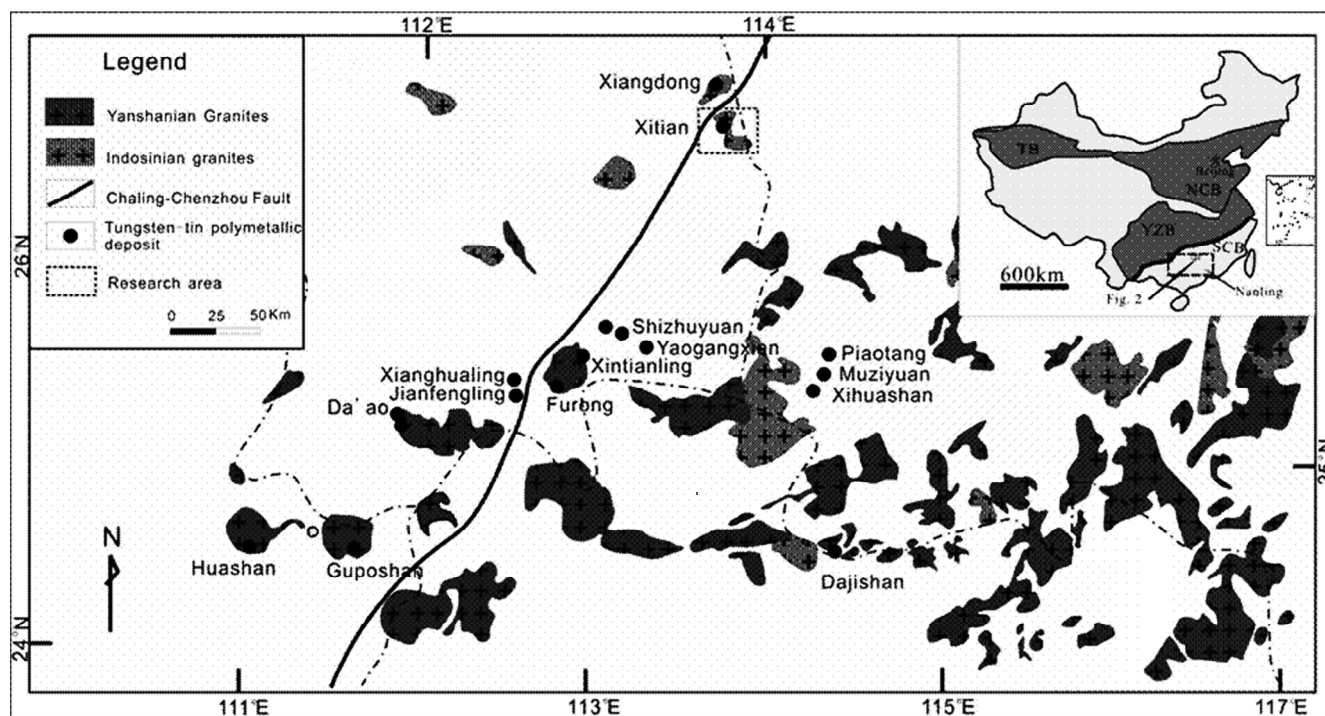


Fig.1. Sketch map of tungsten and tin deposits in the central Nanling region, South China. TB Tarim block, NCB North China block, YZB Yangtze block SCB South China block.

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mineralization in the Xitian W-Sn polymetallic deposit, including skarn type, greisen type and fractured zone type. The former geologists and researchers have investigated the Xitian deposit on its field observation, geological mapping, geochemistry and petrogenesis (Luo et al., 2005; Ma et al., 2005; Xu et al., 2006; Yang et al., 2007; Zeng et al., 2005; Zhou et al., 2013). However, relationship between the ore mineralization and its hosting granites has not been carried out. Thus, we adopted the LA-ICP-MS zircon U-Pb dating method to determine the crystallization age of the Yanshanian granite, and molybdenite Re-Os dating method to determine the ore mineralization, respectively. The zircon U-Pb dating results for one sample of the fine-grained biotite granite from the Xitian deposit yield an average age of  $151.8 \pm 1.4$  Ma, indicating the emplacement age of the Yanshanian granite. It is also consistent with ages of Yanshanian granites closely related to W-Sn polymetallic mineralization in Nanling Range. The Re-Os dating results for five molybdenites from the Xitian deposit give an isochron age of  $149.7 \pm 0.9$  Ma. For the closure temperature for the Re-Os isotopic system in molybdenite is about  $500^\circ\text{C}$  (Suzuki et al., 1996), the molybdenite Re-Os age of  $149.7 \pm 0.9$  Ma can represent the ore mineralization, which is very close to the intrusion age of the Yanshanian granites. This suggests that ores mineralization was coeval with the Yanshanian magma activities, and is indicative of the W-Sn mineralization associated with the Yanshanian granites.

Together with geochronological data published previously for the Nanling metallogenetic, geologists concluded that the Middle Yanshanian (160-150 Ma) was the peak time for extensive W-Sn polymetallic mineralization (Hua et al., 2005a; Hua et al., 2005b; Mao et al., 2008; Mao et al., 2004). Based on this study, the Xitian deposit happened to be in the 160-150 Ma W-Sn polymetallic mineralization event.

There are still different views on the geodynamics of South China. Geologists have been built many models to explain its evolution based on numerous petrogenetic, isotopic and geochronological data (Li et al., 2007; Li et al., 2004; Li and Li, 2007; Mao et al., 2011; Wang et al., 2013). However, it is undebatable that magmatism and related mineralization during Yanshanian period in South China were due to the lithospheric thinning and crustal extension. On the basis of this study, the contents of Re are highly low ranging from 8.7 to 44.0 ppm, indicating a mixed resource derived from the mantle and crust (Mao et al., 1999; Stein et al., 1997; Stein et al., 1998).

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