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The Parasitic Zircon of Mafic Dikes in the Xidaming Mountain of Guangxi Province of China and its Significance

Zhang Liang¹, Xiao Changhao^{2,1}, Wei Changshan², Li Yang¹, Su Xiaokai¹, Pang Yunquan³

¹ School of Earth Sciences and Resources, China University of Geosciences, Beijing 100083, China, zhangliang@cugb.edu.cn

² Institute of Geomechanics, Chinese Academy of Geological Sciences, Beijing 100081, China

³ Guilin University of Technology, guilin 541004, China

The Xidaming Mountain, located in the southwest margin of the Qin-Hang metallogenic belt, is an important Cu-Pb-Zn-Au, W-Sn-Bi-Mo and Fe-Mn-S polymetallic metallogenic belt[1]. There are many metallic deposits in the Xidaming Mountain, including the large Nongtun Pb-Zn deposit and the large Fenghuangshan silver deposit.

The magmatic rocks are rare in this area, limited to a small amount of felsic and mafic dikes in fractured areas. The mafic dikes in the Xidaming Mountain are mainly diabases.

The cathodoluminescence (CL) images of zircon crystals shows there are three types of zircon crystals: (1) inherited zircon, (2) co-magmatic zircon and (3) composite zircon with an inherited core and a magmatic overgrowth.

The U-Pb dating and Hf isotopic composition of zircons in the diabases shows the Xidaming Mountains have experienced multi-periodic magmatism. The U-Pb dating shows there are two magmatic events. One is dated at 93Ma which is the ore-forming age in the Xidaming Mountain area. At 92.0-125Ma, $\epsilon_{\text{Hf}}(t)$ is negative, reflecting anatexis of ancient crust material. It corresponds to the third stage of Mesozoic mineralization in South China. The mineralization is related to the multistage lithospheric extension of the back arc of the southeastern margin of Eurasian continent caused by post-collision tectonics between Yangtze China craton and North China craton, and Pacific plate subduction.[2]

The other ages is 945-963Ma, corresponding to the Jinning Movement. Though this movement, the Yangtze block and Cathaysia block split apart. The $\epsilon_{\text{Hf}}(t)$ values of inherited zircon crystals with ages between 940 Ma and 1232 Ma range from -14.4 to 7.0, reflecting crust-mantle mixing. The oldest age of zircon is 1885.5 Ma, and $\epsilon_{\text{Hf}}(t) < 0$, indicating the presence of old continental crust in the Xidaming Mountain at this time.

References:

[1] Xu Deming et al. (2015) Earth Science Frontiers 22(2):007-024

[2] MAO Jing-wen et al. (2004) Earth Science Frontiers 11(1):45-55

