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LA-ICPMS Zircon U–Pb and Molybdenite Re–Os Isotopic Dating of the Tungsten Deposits in the Dengfuxian W–Sn Orefield, Eastern Hunan Province, South China, and Their Geological Implications

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The eastern and southern Hunan Province is a major part of the Nanling W–Sn metallogenic province of South China, where all W–Sn ore deposits are temporally and spatially related to Mesozoic granitic intrusions. The Dengfuxian ore field comprises the granite complex: Indosinian coarse grained porphyritic biotite granite and Yanshanian middle-fine grained muscovite (two-mica) granite, granodiorite and fine grained quartz granitic porphyry associated with several tens of W–Sn (–Cu–Au–Pb–Zn) polymetallic ore deposits (such as Xiangdong, Dalong, Jiguanshi and Taihexian and others) along their contact zones or contact zones of granites with wall rocks. In this study, four new LA-ICPMS zircon U–Pb ages were determined for three composite granitic plutons, and 6 molybdenite samples from the Xiangdong W–Sn deposit were analyzed by ICP-MS Re–Os isotopic method. LA-ICPMS zircon U–Pb ages for both coarse-gained augen gneissic granite and porphyritic biotite granite from the Xiangdong composite pluton are 222.4 ± 1.6 Ma and 222.6 ± 2.9 Ma, respectively, while LA-ICPMS zircon U–Pb ages for fine-gained biotite granite, muscovite granite and quartz granitic porphyry from the Xiangdong composite pluton are 153.4 ± 2.0 Ma, 148.3 ± 1.4 Ma and 148.4 ± 2.3 Ma, respectively. Molybdenite Re–Os isochron ages for the related Xiangdong tungsten-quartz vein deposit are 142.1 ± 4.2 Ma or 150.5 ± 5.2 Ma (Cai et al., 2012), consistent with zircon U–Pb ages of the Yanshanian fine-gained biotite granite, muscovite granite and quartz granitic porphyry within the measurement uncertainties, indicating that the mineralization of the Dengfuxian tungsten deposit is genetically related to the Early Yanshanian granitic intrusive activities. These new age data indicate that the ages of W–Sn ores and related

granites are Late Jurassic with a peak at ~150 Ma, which corresponds to the widespread Mesozoic metallogenic event in southern China (Mao et al., 1998, 2007, 2008; Hu et al., 2012; Li et al., 2014). Molybdenites from the Xiangdong tungsten deposits have quite low Re contents (57.6 to 7786.0 ppt), suggesting continental crustal provenance of the ore metals (Selby and Creaser, 2011a, b). Similar situations exist likewise in the Taoxikeng deposit and the Tianmenshan–Hongtaoling W–Sn ore fields, in Jiangxi Province (Feng et al., 2011; Guo et al., 2011).

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