On the metallogenesis of the W-Mo deposit in the Yuntoujie granites in South China: evidence from geochemistry and Hf-Nd isotope

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TheYuntoujie deposit is the only Indosinian granite related W-Mo deposit in the Nanling ore belt, South China. The granites in the Yuntoujie ore field consist of an early-stgae batholith and a late-stage W-Mo mineralized muscovite granite which is 10Myr youger than the early stage batholith[1]. These granites have high SiO_2 (70.77 ~ 74.86 wt%), alkaline (K_2O+Na_2O = 6.27 ~ 8.27wt%) concentrations and characterized by peraluminous (mostly A/CNK>1.1, A/NK=1.30 ~ 1.43) and could be classified as S-type granite. The granites are characterized by low $^{143}Nd/^{144}Nd$ values (0.511942~0.512477) and low $\varepsilon_{Nd}(t)$ values (-8.52 ~ -11.76), locating on the field of Nd isotope evolution of Proterozoic crust. The granites have low zircon $\varepsilon_{Hf}(t)$ values (-7.19 ~ -14.89) with T_{DM2} ranging from 1713 Ma to 2187 Ma. These geochemical features suggest that the granites are sourced from partial melting of Proterozoic crust without contribution from juvenile crust. Trace element characteristics such as positive relation of La/Yb with La and negative relation of Ba with Rb of the granites reveal that the late-stage muscovite granite is the product of highly fractionated crystalization of the Yuntoujie magma chamber. The 'tetrad effect' observed in REE patterns of late-stage muscovite granite and abundant fluid inclusions found in quartz phenocrysts in the late-stage muscovite granite imply that the melts of late stage muscovite grante were water saturated and had underwent the processes of fluid-melts reaction.

Based on these characteristics, together with that the Yuntoujie magma chamber had survived for more than 10 Myr, it is suggested that the peraluminous magma experienced stable prolonged period of crystallization differentiation, which results in the late melt water saturated and W-Mo enrichement play a key role in the formation of W-Mo mineralization.The Yuntoujie granites related W-Mo deposits was formed in the post-collisional environment.

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[1]Wu et al., (2012). Chinese Sci Bull, 57, 1024-35.