Abstract: Late Silurian–early Devonian mafic–intermediate dykes occur in the Xiemisitai mountain of the northern West Junggar. However, their ages, petrogenesis and geodynamic process remain to be unraveled. We report firstly in situ zircon U–Pb and hornblende 40Ar–39Ar ages, geochemical and in situ zircon Hf isotopic data for the Xiemisitai dykes. The Xiemisitai dykes give zircon U–Pb ages of 416.7±2.1 Ma and 405.1±2.5 Ma and hornblende 40Ar–39Ar age of 405.9±4.9 Ma, respectively. They are characterized by high εHf(t) values (+11.9 to +15.5), suggesting a depleted mantle features. The Xiemisitai dykes show low Mg# (46–59) and low Cr (11.3–197 ppm) and Ni (19.9–102 ppm) abundances indicating that they have experienced significant fractional crystallization. These dykes contain hornblende and biotite and display negative Nb-Ta-Ti anomalies, enrichment of LREEs, LILEs and depletion of HREEs and HFSEs with high Ba/La ratios, similar with an origin from a depleted lithospheric mantle metasomatized by subducted slab-derived fluids. In addition, the Xiemisitai dykes are plotted within melting trends with little to no garnet (Cpx:Grt=6:1) in their source. The La/Yb vs. Tb/Yb plot also indicates the presence of less than 1% residual garnet in the source region for the Xiemisitai dykes. Therefore, it can be inferred that the Xiemisitai dykes were generated at a correspondingly shallow depth, mostly within the spinel stability field. Finally, the Xiemisitai dykes were most probably generated by partial melting of metasomatized lithospheric mantle in relatively shallow level (<80 km). They could be possibly triggered by the asthenospheric upwelling as a result of the rollback of the subducted Irtys-Palark oceanic lithosphere.

Key words: mafic-intermediate dyke, slab roll-back, CAOB, West Junggar

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