Early Cretaceous granitoids and mineralization of the Aershan and Yili porphyry Mo deposits in theGreat Xing'an Range: implications for the geodynamic evolution of northeastern China

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The mineralization of the porphyry-type molybdenum deposits are located in the eastern Inner Mongolia Autonomous Region in China occurs mainly as veins, lenses, and layers within the host porphyry. To better understand the link between mineralization and host igneous rocks, we studied samples from underground workings and report new Sensitive High Resolution Ion Microprobe II (SHRIMP II) zircon U–Pb and Re–Osmolybdenite ages, and geochemical data from both the molybdenites and the porphyry granites. Twelve molybdenite samples from different deposits yield a Re–Osisochron weighted mean age of 133.6 ± 2.6 Ma, whereas the porphyry granitoid samples yield crystallization ages of 133 ± 1 Ma139 ± 1.5 Ma (Aershan area), and 128.1 ± 1.6 Ma 129.0 ± 3.5 Ma (Yiliarea). The U–Pb and Re–Os ages are similar, suggesting that the mineralizationis genetically related to Early Cretaceous porphyry emplacement. Re contents of the molybdenite range from 21.74 ppm to 52.08 ppm, with an average of 35.92 ppm, whereas δ^{34} $S_{V\text{-}CDT}$ values of the sulphide vary from 0.3‰ to 4.2‰. The ores have $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, and $^{208}Pb/^{204}Pb$ ratios of 18.178–18.385, 15.503–15.613, and 37.979–38.382, respectively. The granitoids from Aershan area are A-type granites. These observations indicate that the molybdenites and the porphyry granites were derived from a mixed source involving young accretionary materials and enriched subcontinental lithospheric mantle. The Early Cretaceous porphyry granitoids from Yili area are adakitic granites, which are characterized by moderate to high $Mg^{\#}$ and high-silica, interpreted as a result of partial melting of thickened lower crust following NNW subduction of the Palaeo-Pacific Plate. A synthesis of geochronological and geological data reveals that porphyry emplacement and Mo mineralization in the eastern Inner Mongolia Autonomous Region occurred contemporaneously with Early Cretaceous tectonothermal events associated with lithospheric thinning, which was caused by delamination and subsequent upwelling of the asthenosphere associated with intra-continental extension in NE China.