Geochronology and isotope (Sr, Nd and Pb) geochemistry of the Oligocene intrusions and associated hydrothermal mineralization in the northeast of Yenice, NW Turkey

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Abstract

Cenozoic calc-alkaline magmatism associated with collisional and post-collisional tectonism is genetically related to various types of mineralization in and around the intrusions in the northeast of Yenice (Çanakkale), Turkey. U-Pb zircon dating of granites yield ages ranging between 25.8±1.6 Ma and 27.4±1.8 Ma. These ages are consistent with the Re-Os molybdenite ages of 25.39±0.10 Ma and 25.76±0.11 Ma, which constrain the timing of the Soğucak and Sofular porphyry mineralization, respectively. Geochemical analyses of five of plutons in the northeast of Yenice region show a magnesian, calc-alkalic, metaluminous and I-type character. Chondrite-normalized REE patterns show strong enrichments in LREEs and depletions in HREEs, with negative Eu anomalies (Eu/Eu*=0.57-0.89). Chondrite-normalized trace-element patterns are characterized by variable enrichments in LILEs and depletions in HFSEs. The Sr and Nd isotopic compositions show a very narrow range and indicate that plutons were generated from the same source. The $^{87}Sr/^{86}Sr_{(i)}$ values range from 0.707074 to 0.708008, whereas their $^{143}Nd/^{144}Nd_{(i)}$ and $\varepsilon Nd_{(t)}$ values vary between 0.512434 to 0.512486 and -3.34 to -2.27, respectively. The Pb isotopic compositions of ore minerals from mineralization clearly show a mixing line between an average Oligocene magmatic signature and a source that has less radiogenic Pb isotope ratios than the associated plutons. The Sr and Nd isotope results indicate that intrusions were generated by magmatic assimilation and fractional crystallization and formed during large-scale lithospheric thinning during the Late Oligocene. The Re-Os ages and Pb isotopic compositions for mineralization suggest that the hydrothermal ore-forming processes were related to the late stages of magmatic–hydrothermal systems.