

Re-Os Molybdenite Geochronology from Turkish Porphyry Copper Prospects

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Five Re-Os molybdenite ages for Cevizlidere, Kabataş, Çopler, and Gelemiş porphyry copper-molybdenum ± gold prospects and/or associated epithermal and skarn mineralization from Turkey constrain the timing of mineralization systems in this region. Samples were analyzed at the Re-Os Geochronology Lab, University of Arizona, Tucson, Arizona, USA. The ages of the studied prospects are between 46.4 and 51.1 Ma (i.e., early to middle Eocene) and 26 Ma (late Oligocene). The oldest porphyry mineralization is the Kabataş prospect (51.1 ± 0.4 Ma), followed by the emplacement of the Çopler hydrothermal event at about 46.9 ± 0.3 to 46.4 ± 0.3 Ma. The Gelemiş prospect in western Turkey has Re-Os molybdenite ages of 46.4 ± 0.3 Ma, the same as at Çopler. Re-Os dating of Cevizlidere yielded a 26.0 ± 0.2 Ma age, which is the youngest porphyry mineralization reported in Turkey. Total Re and ¹⁸⁷Os concentrations for studied molybdenites range from 4,754 to 169 ppm and from 2,334 to 82 ppb, respectively. The samples from Çopler and Kabataş show very high Re and Os concentrations and are among the highest reported for porphyry Cu-Mo deposits. The deposit with the highest Re and Os concentrations is Çopler, and the lowest concentrations are found in Gelemiş. The ages determined support the formation of porphyry copper mineralization in Turkey during the Alpine orogeny. Porphyry copper (+gold-molybdenum) deposits (PCDs) and prospects in the Western Tethys can be grouped in four belts of Late Cretaceous to Paleocene (92–59 Ma), early to middle Eocene (52–36 Ma), late Oligocene (26–23 Ma), and early to late Miocene (22–9 Ma) age. In general, the ages of PCDs in the Alpo-Himalayan province range from ~90 Ma at Elatzite, Bulgaria, to ~9 Ma at Rosia Poieni, Romania. The ages also show that porphyry copper mineralization occurred continuously between these two dates. The only known world-class porphyry deposits in the region are emplaced with two main episodes at ~84 Ma (Bor-Majdanpek, Timok magmatic belt, Serbia) and at ~11 Ma (Sar Cheshmeh in Iran).