Cu-Mo porphyry deposit of the Erdenetiin Ovoo: an environmental study

O.Gerel, S. Dandar, S. Myagmarsuren, and B. Soyolmaa
Mongolian University of Science and Technology, P.O. 46, Box 520, Ulaanbaatar 210646, Mongolia and Department of Geology, Saint Mary's University, Halifax, NS, B3H 3C3

Erdenetiin Ovoo, the largest porphyry copper-molybdenum deposit in Mongolia (1.78 Gt @ 0.62 % Cu and 0.025 % Mo) is exploited by the Erdenet mine located in northern Mongolia, 240 km northwest of the capital, Ulaanbaatar. The deposit was discovered in 1964 and has been mined since 1978. The mine is an open pit which extends over an area of 2500 × 1150 m. Its annual production rate is approximately 20 Mt of ore; the mine produces over half of the total Mongolian income and export earnings.

The deposit is hosted by the Erdenet pluton, a part of the multistage Permo-Triassic Selenge Intrusive Complex which occurs within the Orkhon-Selenge volcano-sedimentary trough that developed on an active continental margin. The mineralization and alteration post-date the emplacement of the pluton and are related to the shallow-level porphyritic intrusions (stocks and dikes). These intrusions are genetically related to the trachyandesitic volcanic series of late Triassic-early Jurassic age emplaced in a continental collision setting. The deposit is a cylindrical body of quartz-sulphide stockwork veinlets hosted by an ore-bearing granodiorite porphyry intrusion about 2.4 × 1.4 km in area. Mineralization yielded an age of 240.7 ± 0.8 Ma (Re-Os on molybdenite).

Ore-bearing porphyries are medium-high K calc-alkaline granitic rocks of the I-type, magnetite series. Their mantle-normalized trace element patterns show depletion in Nb, Ti and P and are typical of granitic rocks from an active continental margin environment. There are three alteration assemblages which show a distinct concentric zonation. From the core to the periphery, the alteration zones are sericitic (quartz-sericite), intermediate argillic (chlorite-sericite) and propylitic (chlorite and epidote-chlorite). The deposit occurs within the quartz-sericite alteration zone. Quartz-molybdenite and quartz-chalcopyrite veinlets are related to this alteration stage. The alteration halo is about 2.7 × 2.2 km in size.

An environmental study in the area of the Erdenet open pit mine and surroundings shows that, apart from the tailings, the mining impact is relatively small. The average of 195 soil samples from the Erdenet area is (in mg/kg): As 7.1 mg/kg, Be 1.0, Cd 0.1, Co 11.4, Cr 39.5, Cu 34.9, Mo 0.50, Ni 22.3, Pb 11.7, V 75.9, Zn 64.2, Hg 0.02. The values are below the government limits for all these elements. Likewise analyses of vegetation yielded values which do not exceed the limits. The results show that airborne dust from the open mine pit, tailings and mine roads has not significantly contaminated the mine surroundings.

Copyright © 2015 Atlantic Geology