Dating of alteration at the Radomiro Tomic porphyry copper deposit, northern Chile, by the high-precision $^{40}Ar/^{39}Ar$ method

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The Radomiro Tomic (RT) porphyry copper deposit is located approximately 5 km north of the Chuquicamata mine and 245 km northeast of the port city of Antofagasta. Estimates place the deposit at 800 million tonnes of ore with an average grade of 0.59% Cu (mostly supergene ore) and a mine life of 22 years. RT does not outcrop and has been known only from drillcore and limited underground workings. The entire deposit is buried beneath Miocene piedmont gravels up to 200 m in depth. Stripping is now underway and the mine is due to start operating in 1997 as a new separate division of CODELCO.

The deposit is hosted within an intrusive body of granodiorite to monzodiorite composition that is approximately early to middle Oligocene in age and was emplaced within the regional, north-south trending Domeyko Fault system. This system is spatially associated with all the major porphyry deposits in northern Chile.

The intensity of copper mineralization (bornite and chalcopyrite) is proportional to the intensity of potassic alteration. Quartz-sericite alteration is structurally controlled and overprints the potassic alteration zone. The quartz-sericite alteration is also associated with relatively unimportant chalcopyrite and covellite mineralization. The propylitic zone surrounds the potassic zone and is characterized by the presence of epidote, chlorite, quartz and carbonate. Hypogene mineralization (bornite, chalcopyrite and pyrite) is extensive, where supergene mineralization is generally contained between 100 m subcrop and 400 m depth, with localized areas associated with the more fractured quartz-sericite alteration extending to a depth of 800 m. Supergene mineralization consists of chalcocite and covellite. It underlies a thick blanket of oxidized ore consisting of soluble copper oxides and copper halides.

This study will date both the potassic and quartz-sericite alteration assemblages. K-feldspar, biotite and sericite grains were hand-picked from the six drillcore samples and dated by the high-precision, stepwise degassing $^{40}Ar/^{39}Ar$ technique at Dalhousie University. Preliminary results indicate the influence of a single major hydrothermal event of Oligocene age rather than the two events that have been defined at the Chuquicamata deposit. The K-feldspar spectra are suitable for thermal modelling which will be done in

order to ascertain closure temperatures and cooling rates. A full suite of ancillary data is being generated on the dated samples to establish not only the petrology, mineralogy and chemistry of the dated rocks but to compare them with similar rocks at Chuquicamata. The study is expected to help place RT within the context of the regional geology and other mineralized centres in northern Chile.