

RE-OS DATING OF ARCHEAN TO CENOZOIC ORE DEPOSITS: AN OVERVIEW OF SUCCESSFUL STUDIES

STEIN, H.J., MORGAN, J.W., MARKEY, R.J., and HANNAH, J.L., AIRIE, Colorado State University, Fort Collins, CO 80523-1482 USA

The Re-Os method provides a robust chronometer for dating sulfides and oxides in the ore-forming environment and for evaluating plutonic-volcanic, tectonic, and metamorphic events. The AIRIE Group produces accurate and precise Re-Os ages (2-sigma uncertainties) from a wide range of geologic settings, including both pristine Tertiary systems and Archean environments with regional metamorphic overprints. For example, fifteen Au-associated pyrites from Sigma (Val d'Or, Abitibi, Quebec) yield a Re-Os isochron of 2678 \pm 23 Ma, and single mineral dating of molybdenite from Hemlo Au mines (Ontario) yields four tight ages of 2657 to 2664 with \pm 9 Ma uncertainties. Re-Os dating also yields geologic surprises. At Pitkaränta (western Russia), Re-Os dating of Proterozoic molybdenite from W-Mo-Cu skarn ores, commonly attributed to the 1540 Ma Salmi batholith, revealed an older 1800 Ma Svecofennian age for mineralization. In Colorado (USA), Re-Os isochron dating of molybdenite from small non-economic pegmatites, records a major Proterozoic crust-forming event at 1427 \pm 20 Ma. In Africa, three Re-Os ages for molybdenite delineate two closely-spaced periods of mineralization for the Kansanshi Cu deposit (Zambia), one associated with the main Cu event at 512.9 \pm 1.7 and 511.8 \pm 1.7 Ma, and the other with later Cu-poor veins at 503.0 \pm 1.7 Ma. We have also produced a 5-point pyrite-tennantite isochron (42.37 \pm 0.45 Ma; MSWD = 1.3) for the Cu-Mo porphyry at El Salvador, Chile. We will present examples of Re-Os dating of molybdenite and other sulfides that illustrate the high precision and accuracy offered by this chronometer.