

SR-ND ISOTOPIC TRACING FOR THE ARCHEAN GOLD DEPOSITS IN THE KALGOORLIE-NORSEMAN REGION, WESTERN AUSTRALIA

1,2Ghaderi, M., 1 Bennett, V.C., 1Palin, J.M., 1Campbell, I.H. and 1McCulloch, M.T. 1Australian National University, Canberra, Australia; 2Tarbiat Modarres University, Tehran, Iran.

The Sr and Nd isotopic compositions are reported for 34 samples of scheelite (CaWO_4), which is a widespread accessory mineral spatially associated with the hydrothermal veins in the Archean gold deposits throughout the Kalgoorlie-Norseman region of Western Australia. The isotopic compositions were also determined for the potential source rocks for the gold ores, in order to identify the source(s) of Sr and Nd in the fluids from which the scheelites crystallized and, by inference, the source of gold in the region. The results of this study suggest that due to the differences in their geochemical behaviors, Sr and Nd isotope systems respond differently in hydrothermal systems. Strontium is more soluble than Nd in hydrothermal fluids which results in Sr isotopes seeing further down the fluid pathway and providing a better indicator of the long-range fluid history. Neodymium isotopes, on the other hand, mainly reflect local sources. The scheelites with the most radiogenic Sr values are from the central Norseman where the gold deposits are located in a relatively narrow greenstone belt surrounded by granite-gneiss bodies. The radiogenic Sr isotope ratios in these scheelites imply that the Sr was derived from a granitic or mixed granite-greenstone source. In contrast, the Nd isotopes in the same scheelites reflect only the isotopic compositions of the local mafic and ultramafic rocks. At Kambalda, Coolgardie and Kalgoorlie, where the deposits are farther from the granitic basement and located above the komatiites, a mainly mafic/ultramafic source is indicated by both Sr and Nd. If the ore fluids have extracted Sr and Nd from a wide variety of both mafic and felsic rocks, as demonstrated here, then these are the probable source rocks of the Au as well.