SULFUR ISOTOPY OF PYRITE FROM AURIFEROUS WITWATERSRAND REEFS AS AN INDICATOR OF SEDEX MINERALIZATION

1KREMENETSKY, A.A., 1IOUCHKO, N.A., and 2JORDAAN, L.J. 1Institute of Mineralogy, Geochemistry and Crystal Chemistry of Rare Elements, Moscow, Russia; 2Geological Survey of South Africa, Pretoria, Republic of South Africa

This paper presents new data on S-isotopy of major pyrite generations and associated base metal sulfides from auriferous reefs and hosting rocks (quartzite, basalt), the Witwatersrand paleo-basin, South Africa. A narrow range of ?34S observed in pyrite (-3.9…+3.3‰), base metal sulfides (-1.5…+0.9‰), and, especially, sulfides from komatiite (-1.3…0.0‰) indicates mantle origin of sulfur. Among the Au-bearing pyrite pebbles maximum deviations from the meteoritic standard and relative accumulation of 34S (+2.3…+2.8‰) is typical of compact pyrite, and 32S – of porous pyrite (-3.9‰ as a maximum). Thus, sedimentary exhalative (SEDEX) formation could occur under different conditions: compact pyrite deposited at the axial zones (chimneys) of the paleo-'black smokers', whereas the porous variety of the mineral – along the periphery of the 'chimneys' either further outwards, in siliceous ooze, at weak sulfate reduction. The post-sedimentation transformations of Au-bearing conglomerates induced by hydrotherms resulted in partial alterations of pyrite pebbles (especially, their porous varieties). Hence a shift to minimum ?34S values (+1.8…+2.0‰). These are typical of sub-idiomorphic (late) pyrite generation (-0.1…+1.5‰) and associated pyrrhotite (+2.0‰), as well as base metal sulfides (-1.5…+0.9‰). The fact that auriferous pyrite pebbles originally are SEDEX products which occur in numerous reefs indicates a significant role of the SEDEX process in the Witwatersrand paleo-basin. This process supplied a greater part of Au resources (mainly, as disseminations) from an endogeneous source of ore components.