



Pyrite d34S spot-analyses of selected reefs of the Witwatersrand Basin and implications for interpretation of the gold emplacement

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Results will be presented of spot-analyses in pyrite grains for sulfur isotopic composition in a selected number of sample preparates from gold bearing reefs of the Witwatersrand Basin, South Africa by Secondary Ion Mass Spectrometry (SIMS: Cameca IRM1270). Isotopic results are compared with published data and show larger d34S variety than published material sofar. This difference is explained to be caused by the different analytical methods that were applied. The classical combustion method, used for the published data, is based on analysis of a combined number of grains, while in the present study it is shown that isotopic variety exists inside and between single grains. Further, duplicate analyses were performed by the combustion method, where probably those duplicate analyses with differences larger than 0.2‰ from the mean were considered erroneous and repeated until a duplicate inside this 0.2‰ limit was found. Thus the data produced by the combustion method represent a relatively narrow d34S range instead of showing all existing variety in the separate grains. The interpretation based on the older, narrow range of d34S values is that sulfur of the sulfides has an igneous signature. Explanation for the deposition of the sulfides and gold is that they form detrital products from erosion of igneous source rocks surrounding the Witwatersrand Basin (although no unambiguous source-rock ever was determined), where they were transported in an anoxic environment and the sulfide and gold were deposited as detrital material. This interpretation, however, cannot be supported by the results of SIMS single grain spot-analyses, showing a far wider range of d34S values. An alternative interpretation is detrital deposition of sulfide and gold and later remobilization by hydrothermal fluid circulation in one or more events. Igneous activity in the region, shown also by volcanic activity during and after the Witwatersrand Basin

development, may have caused such a hydrothermal activity, and the remobilization of sulfur and gold, with eventual concentration of gold in the reefs. In conclusion, I like to stress that isotopic analysis should be applied at the same scale of the processes that are responsible for the isotopic variety in a specific system.