

Isotope study of Neoproterozoic to Lower Palaeozoic successions of the southern Kalahari craton

THANUSHA NAIDOO^{1*}, UDO ZIMMERMANN¹,
J.T. MIYAZAKI² AND J. VERVOORT³

¹Institutt for petroleumsteknologi, Universitetet i Stavanger, Norway (*correspondence: thanusha.naidoo@uis.no)

²Institute For Research on Earth Evolution, JAMSTEC Natsushimacho, Yokosuka, Japan (tmiyazaki@jamstec.go.jp)

³School of Earth and Environmental Sciences, Washington State University, Pullman, USA (vervoort@wsu.edu)

The southern area of the Kalahari Craton is characterized by isolated Neoproterozoic to Lower Palaeozoic basins containing mostly immature psammites and pelites, and few carbonates. Outcropping conglomerates were falsely interpreted as glacial deposits in the wake of the snowball earth hypothesis, as none of the sedimentary rocks of the basins contain any characteristics of a glacial event or associated cap carbonates. Age constraints for the rocks are weak. Pb-Pb isotopes on carbonates point to an Ediacaran age but might reflect a metamorphic age. Sr and C isotope values do not always reflect primary seawater composition since clastic input and other environmental factors have hampered the results. Microfossil analyses show a low-species assemblage typical for the Early Ediacaran and alternatively the Uppermost Ediacaran, and global biostratigraphic markers are absent. Trace element geochemistry proposes, for some of the rocks, the influence of a mafic source mixed with felsic sediments, but high Ti, Nb and Ta concentration exclude a direct arc source. Detrital zircon analysis revealed the occurrence of Ediacaran zircons, in addition to Mesoproterozoic zircons as major source rock ages. Pb and Nd isotopes are comparable to those from the basement of Patagonia and the Arequipa-West Pampeanas Terrane. Nd model ages vary between 1.3 and 1.8 Ga, which is unexpected for the Kalahari Craton. This similarity to Patagonia suggests that, during the formation of Rodinia, the southern margin of the Kalahari Craton faced Patagonia or even shared the same basement. If so, then Patagonia possibly drifted slightly off the Kalahari craton during the Lower Palaeozoic and finally, into its modern position during the Late Palaeozoic.

Sorption of uranyl and arsenate on SiO₂, Al₂O₃, TiO₂ and FeOOH

SREEJESH NAIR* AND BRODER J MERKEL

Department of Hydrogeology, Technische Universität Bergakademie Freiberg, Gustav-Zeuner Str.12, 09599 Freiberg, Germany

(*correspondence: sreejeshmc@gmail.com)

Migration of uranium or arsenic in aquatic environments is often controlled by sorption on minerals present along the water flow path. One of the major controlling factors of sorption is the aqueous speciation of these elements. Hence it is important to know the major species in order to predict the sorption behaviour in the environment. The formation of uranium-phosphate complexes was investigated rather well, but thermodynamic data are still contradictory. On contrary, less information is available about the formation of uranium-arsenate complexes. To investigate the sorption behaviour, batch experiments were conducted for uranium (0.5 μ M/l), arsenic (0.5 μ M/l) and uranium-arsenic (0.5:0.5 μ M/l) together with SiO₂, Al₂O₃, TiO₂ and FeOOH at a pH ranging from 3 to 9. Sorption of U (VI) and As (V) on SiO₂ is almost similar in solutions containing either U (VI) or As (V) separately, or both together. Similar sorption behavior was observed for FeOOH too. In the presence of equimolar U (VI) and As (V) together, a considerable retardation of U (VI) sorption and an enhancement of As (V) sorption on Al₂O₃ was observed for a wide range of pH (Fig. 1). While Al₂O₃ was replaced with TiO₂, an increase in sorption was observed for both uranium and arsenic. This change in sorption retardation/enhancement can be explained by the formation of uranylarsenate complexes or competitive sorption between uranyl and arsenate species.

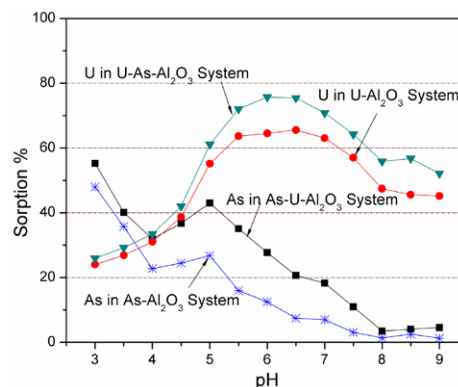


Figure 1: Sorption of U(VI) and As(V) on Al₂O₃ as a function of pH. Either U(VI) or As(V) separately, or both together. (0.5 μ M/l U & As, 23°C, pCO₂ 10-3.5 hPa).