Behavior of accessory minerals during Paleoproterozoic (1.9 Ga) weathering processes, Beaverlodge Ridge, NWT, Canada

PAUL SHAKOTKO*[1], LUKE OOTES[2] AND YUANMING PAN[1]

[1]University of Saskatchewan, Geological Sciences
phs090@mail.usask.ca
yup034@mail.usask.ca
[2] NWT Geoscience Office, Yellowknife, NT
luke_ootes@gov.nt.ca

Abstract

A well-preserved 1.9 Ga regolith that formed from a quartz-feldspar porphyry of dacitic composition at Beaverlodge Ridge, NWT, Canada, is overlain by a quartz arenite and has been overprinted by a greenschist facies regional metamorphism. Continental reconstruction placed Beaverlodge Ridge near the equator and thus tropical paleolatitude conditions at ~ 1.8 Ga [1]. The maximum AI and PIA values of 77 and 96, respectively, indicate heavy weathering during the formation of the Beaverlodge Ridge regolith. While Si, Fe, K, Ca, and Ti display an upward increase towards the unconformity, Na and Mg have been removed from the profile. Aluminum, Mn, and P remain relatively constant throughout the profile. These major element trends are inconsistent with other Paleoproterozoic regoliths (Gall, 1994; Pan and Stauffer, 2000) and are also inconsistent with a modern-day dacite weathering profile (Shangyi et al., 2007). Both of these show an upward loss in Ca. Subsequent analysis of the weathering rinds of porphyry in the quartz arenite shows a depletion in Ca relative to the altered porphyry. This suggests that the upward increase in Ca observed in the porphyry might be due to later overprinting events.

Electron microprobe analysis and back-scattered electron imaging reveal that accessory minerals such as zircon, allanite, and fluoroapatite in the Beaverlodge Ridge regolith are well preserved, whereas Fe and Ti oxides such as magnetite and rutile often display extensive weathering and show evidence of surface weathering such as etching and pitting. Zircon grains are sub- to euhedral, whereas allanite grains are anhedral. Fluoroapatite occurs in two different morphologies: 1) distinctly zoned, sub- to euhedral grains with overgrowth rims that often containing monazite inclusions within or adjacent to these overgrowths, and 2) lacking growthzones and monazite inclusions. Further morphological and compositional analyses of accessory minerals are underway to examine their roles in controlling the major and trace elements in the Beaverlodge Ridge regolith. These results are expected to shed new light on the oxic atmosphere ca. 1.9 Ga and lead to a greater understanding of GOE.

References

[1] Hou et al. (2008) Gondwana Research. **14**, 395-409.
Gall, (1994) Precambrian Research. **68**. 115-137.
Pan and Stauffer, (2000) American Mineralogist. **85**, 898-911.
Shangyi et al. (2007) Chinese Journal of Geochemistry. **26**, 4, 434-438.

OSMIUM CONTAMINATION OF SEAWATER SAMPLES STORED IN POLYETHYLENE BOTTLES

M. SHARMA[1]*, C. CHEN[1,2], T. BLAZINA[1,3] AND, K. LANDAU[1]

[1]Dept of Earth Sciences, Dartmouth College, Hanover, NH 03755 USA Mukul.Sharma@dartmouth.edu (* presenting author)
[2]Halliburton, 1805 Shea Center Dr, Suite 400 Highlands Ranch, CO 80129 USA
[3]Eawag, Überlandstrasse 133, 8600 Dübendorf, Switzerland.

A low blank-high yield procedure for the accurate determination of seawater osmium concentration and isotope composition has been developed. The resulting improvement in the detection limit reveals a subtle but significant temporal increase in the concentration of samples obtained during the GEOTRACES expeditions. This increase in Os concentration is accompanied by a decrease in the $^{187}Os/^{188}Os$ ratio of the water indicating contamination of waters from the storage bottles. These samples were stored in HDPE bottles. In comparison, analyses of another aliquot of water stored in a Teflon bottle show no Os contamination. Extending our analyses further to samples collected in LDPE bottles during SAFe expedition we find that the water has been contaminated. Additional investigations reveal that LDPE bottles could contribute large amounts of Os with an $^{187}Os/^{188}Os$ ratio that is distinctly lower than seawater. We also find that an acidified melted snow sample stored in an acid washed Teflon bottle is not contaminated after two years of storage. We conclude that the acidified seawater samples need to be stored in Teflon bottles for accurate and precise estimate of Os concentration and isotope composition. Consideration of reliable Os isotope data indicates that Os is not a conservative element and that the $^{187}Os/^{188}Os$ ratio of the surface water of the interior of the north Atlantic and north Pacific gyres is ~2-3% lower than that of the deep oceans. Additional analyses from the recently completed GEOTRACES cruise in the Atlantic are underway and will be presented.