

The uptake of radionuclides into nanoparticulate hydroxyapatite

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Hydroxyapatite (HAp) is a potential material for the remediation of metal contaminated waters [1, 2] and as a radionuclide waste storage material [3]. *Serratia* sp. cells bio-manufacture nanophase hydroxyapatite (Bio-HAp) from the substrates glycerol 2-phosphate and Ca^{2+} [4]. Varying the manufacturing conditions influenced Bio-HAp properties (e.g. organic content, Ca/P ratio, specific surface area (SSA), and crystallite size).

The uptake of key radionuclides was investigated: Eu^{3+} (as an analogue for trivalent actinides), U^{6+} , Sr^{2+} and Co^{2+} . All the Bio-HAp (n=10) tested in this study were more efficient than commercially available HAp. For Eu^{3+} , Co^{2+} , Sr^{2+} the main Bio-HAp properties that increased metal uptake were: decreasing crystallite size, increasing SSA and organic content. However U^{6+} uptake showed no relationship to these properties. Figure 1 shows the relationship of crystallite size and Eu^{3+} uptake (mmol per 100g).

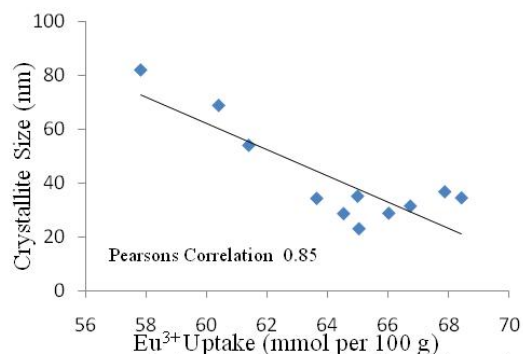


Figure 1: Relationship between Eu^{3+} uptake and crystallite size.

Overall, Bio-HAp shows promise for the remediation of aqueous metal waste especially since Bio-HAp can be synthesized for optimal metal uptake properties.

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[2] Simon (2004) *Sci. Total Environ.* **326**, 249-256. [3] Oelkers (2008) *Elements* **4**, 113-116. [4] Thackray (2004) *J. Mater. Sci. Mater. Med.* **15**, 403-406.

Petrogenetic implications from PGE in the layered mafic Dufek intrusion and related sills of the Ferrar large igneous province, Antarctica

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The Jurassic Ferrar large igneous province extends in a >3000 km long, linear belt along the western margin of the East Antarctic craton and comprises numerous sills, dikes and lava flow sequences as well as the layered mafic Dufek intrusion. According to previous studies, the strikingly uniform crust-like trace element and isotope data have been interpreted to indicate a single magma source within the subcontinental lithospheric mantle characterised by crustal enrichment due to Palaeozoic subduction processes.

The goal of the present study is to further describe the petrogenesis of the Ferrar magmatic rocks by investigating the fractionation behaviour of platinum-group elements (PGE) during magmatic evolution. Therefore, we studied the stratigraphic distribution of PGE throughout both the Dufek intrusion and selected Ferrar sills from Northern Victoria Land by analysing the abundances of Ir, Ru, Rh, Pt and Pd by ID-ICP-MS after NiS-fire in about 130 rock samples.

Considering the lithological and geochemical variability, the studied rocks also exhibit highly variable PGE compositions; PGE totals range from 4 to 138 ppb within Ferrar sills and reach up to ~800 ppb for analysed rocks from the Dufek intrusion. In general, the combined PGE are dominated by Pt and Pd with the Ir-PGE often being near or below detection limits indicating a strong fractionation between the single PGE. The samples analysed do not show clear variations of PGE as a function of stratigraphy or modal rock composition. Obviously, only Fe-Ti oxide-rich rocks from upper parts of both the sills and the Dufek intrusion exhibit significantly elevated PGE concentrations.

The PGE characteristics obtained are attributed to an extensive pre- and post-emplacement differentiation history under mainly sulphur-undersaturated conditions resulting in PGE enrichment until the onset of Fe-Ti oxide fractionation at advanced stages of low-pressure magma evolution. The inferred very low level of S-saturation during differentiation processes of the Ferrar magmas is in agreement with an origin of their primary magmas by high-degree partial melting of a refractory, sulphur-depleted subcontinental lithospheric mantle source proposed beneath this province.