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Authors: Rachel A. Pepper, Sara J. Couperthwaite, Graeme J. Millar



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Value Adding Red Mud Waste: Impact of Red Mud Composition upon Fluoride Removal Performance of Synthesised Akaganeite Sorbents

Rachel A. Pepper¹, Sara J. Couperthwaite* and Graeme J. Millar

Institute for Future Environments & School of Chemistry, Physics & Mechanical Engineering¹, Science and Engineering Faculty, Queensland University of Technology (QUT), GPO Box 2434, Brisbane, Queensland 4001, Australia.

*Corresponding Author

Dr Sara J. Couperthwaite: Senior Lecturer; Science and Engineering Faculty; Queensland University of Technology; P Block, Level 7, P701A-1, Gardens Point Campus; Brisbane; Queensland 4000; Australia

ph +61 7 3138 4766 | mobile +61 432 989 263 | email sara.couperthwaite@qut.edu.au

Highlights

- Red mud based akaganeite (RMA) was synthesised using a robust synthesis procedure
- RMA had 250% greater fluoride capacity compared to granular ferric hydroxide (GFH)
- RMA retained up to 90% of fluoride capacity in presence of competing anions
- Red mud composition impacts RMA performance but capacity remained greater than GFH
- Tunnel structure of akaganeite proposed to enable superior akaganeite sorption

ABSTRACT

This study presents a novel utilisation of bauxite residue through the development of a highly selective sorbent for fluoride ions. The performance was shown to be superior over the equivalent commercial material (granulated ferric hydroxide (GFH)). The aim was to determine the influence of red mud composition upon solution fluoride uptake. Nanocrystalline red mud akaganeite (RMA) was created regardless of the red mud source and incorporation of elements such as aluminium (0.59 - 1.24 wt %) and titanium (1.35 - 3.02 wt %), was observed. Fluoride removal was studied with consideration of contact time,

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