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PII: S2213-3437(18)30120-9
DOI: https://doi.org/10.1016/j.jece.2018.02.048
Reference: JECE 2240

To appear in:

Received date: 21-12-2017
Revised date: 25-2-2018
Accepted date: 28-2-2018

Please cite this article as: Rachel A.Pepper, Sara J.Couperthwaite, Graeme J.Millar, Value Adding Red Mud Waste: Impact of Red Mud Composition upon Fluoride Removal Performance of Synthesised Akaganeite Sorbents, Journal of Environmental Chemical Engineering https://doi.org/10.1016/j.jece.2018.02.048

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

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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,