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Solid-Liquid Separation of Radwaste Suspensions Using Polyacrylamide Flocculation Agents

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The separation of fine particles from aqueous suspensions is a major challenge in radwaste management, particularly during the treatment of sludges from aging facilities. These sludges often contain stable micron-sized solids that hinder dewatering. Retrieval operations can exacerbate colloid persistence, increasing the risk of radionuclide mobility and compromising facility safety. Conventional methods often fail to achieve the clarity or compaction required for effective processing. As a solution, high molecular weight polyacrylamide (PAM) flocculants are widely applied to enhance particle aggregation, accelerate settling, and reduce supernatant turbidity. Polymeric flocculation, typically used in wastewater treatment, has shown promise in improving radwaste dewatering.

This study evaluates a suite of PAM flocculants for enhancing the solid-liquid separation of calcite-based suspensions that simulate the behaviour of inorganic nuclear waste sludges. The goal is to understand flocculation performance under variable shear conditions and the corresponding sedimentation and flotation performance. This work will help support efficient legacy radwaste treatment.

This study demonstrates that PAM can significantly enhance the separation of calcite suspensions representative of radwaste sludges. Optimal sedimentation was achieved using A-PAM, producing stable flocs and effective turbidity reduction. However, these systems exhibited limited flotation. In contrast, C-PAM, while less effective for settling, delivered the highest flotation recovery, likely due to favorable interactions with the anionic collector under alkaline conditions. These findings support the use of tailored flocculant selection to balance sedimentation and flotation goals in radwaste dewatering applications.

Technical Track

Fuel Cycle and Waste Management

Primary author: RUMNEY, Jacob (University of Leeds)

Co-authors: Ms DE MEDEIROS, Regina (University of Melbourne); Mr NG, Wei (University of Melbourne); Prof. FRANKS, George (University of Melbourne); Prof. WARREN, Nicholas (University of Sheffield); Prof. PEAKALL, Jeffrey (University of Leeds); Dr HARBOTTLE, David (University of Leeds); Dr LOCKWOOD, Alexander (Sellafield Ltd); Dr HUNTER, Timothy (University of Leeds)

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