Ultrafiltration-based recovery of coagulants for reuse in potable treatment

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1. The Problem

Raw water → Clarified water

Coagulant
>325,000 tonnes/year[1]
>£28m/year[1]
- Stringent regulations
- Commodity prices
- Raw water quality

Current costs (UK)

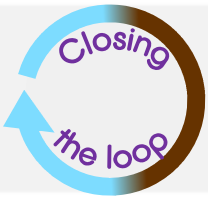
Future challenges

Water treatment residuals
>182,000 dry tonnes/year[2]
>£6m/year[3]
- Reduced landfill availability
- Competition from other wastes
- Concern over toxicity
- Transport costs

2. Coagulant Recovery

A simple solution? Reagent → Catalyst

Coagulant requirements and sludge production are both reduced



i) Coagulant within sludge is solubilised and regenerated by adding acid

ii) Removal of co-solubilised contaminants before the coagulant reuse in potable treatment

3. Why is it not already in use?

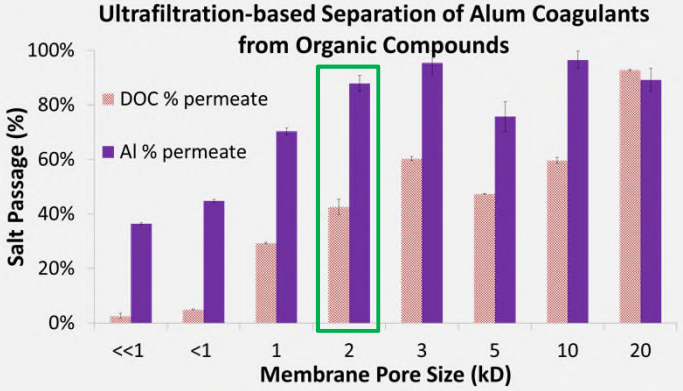
Commercial coagulants are still relatively cheap and recovery processes have previously struggled to recover coagulants on an economically viable basis

Carry-over of the impurities can contaminate the recovered coagulant. This threatens treatment performance and risks failure of water quality regulations.

A review of the literature and economic modelling were used to identify the most economically viable selective recovery process: ultrafiltration

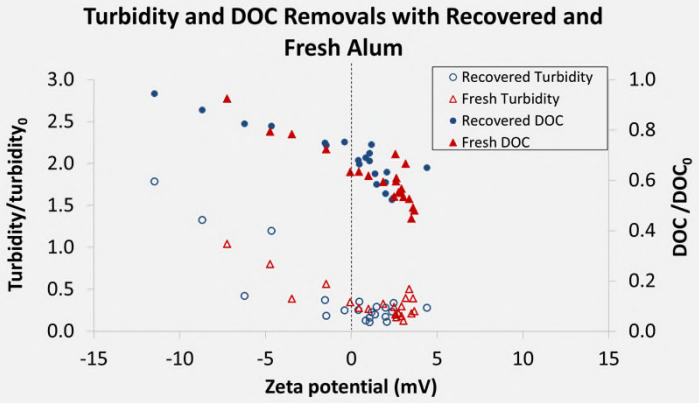
4. Selective Recovery with UF

Determining the correct pore size is key to successfully recovering coagulant while also rejecting unwanted organic contaminants.



5. Coagulant Performance

- Jar tests were used to compare recovered alum to fresh commercial coagulant
- Turbidity and DOC removals were matched (±10%)



6. Outlook

- Despite incomplete rejection of DOC, recovered alum performs well
- Alum can be recovered using ultrafiltration at economically feasible fluxes
- Work will be repeated for ferric coagulants, to determine their performance
- Stringent potable disinfection by-product regulations may limit the uptake of potable coagulant recovery; future work will investigate the implementation of reusing recovered coagulant in wastewater treatment, where the regulatory framework is more accommodating to elevating DOC loads.

References: 1. Henderson, 2004; 2. Pan, 2004; 3. UKWIR, 1999

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