

Removal of natural organic matter using self-assembled monolayer technology

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ABSTRACT

The use of nanotechnologies in water treatment for the removal of natural organic matter (NOM) is a relatively new concept. Using simple self-assembled monolayer (SAM) techniques, a silica substrate was modified as an adsorbent and tested for its potential for reduction of water quality parameters such as UV absorbance, colour and dissolved organic carbon (DOC). Silica particles that were coated with an amino-siloxane SAM (NH₂-SAM) were evaluated in both a high surface area powder form and also a more realistic granular sand form. Initial results using direct stirred contact with powdered NH₂-SAM showed promising results with 60% reduction of UV₂₅₄ after 1 h and up to 70% removal of DOC with higher doses and contact times. NH₂-SAM powder removed NOM in a broader and less selective molecular weight (MW) range than coagulation treatment and this removal was enhanced by pH control at 6, especially for medium MW components. When NH₂-SAM sand was applied, the significantly reduced effective surface area resulted in lower DOC removal but colour removal was still considerable for realistic treatment plant contact times. Attempted regeneration with acidic solutions showed greater effectiveness at lower applied pH, however recovery of adsorption capacity reduced with successive adsorption/regeneration cycles highlighting the need for further refinement of operating conditions for more effective application of this relatively simple water treatment technology.

Keywords: Natural organic matter; Self-assemble monolayer; Water treatment

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