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Engineering Cellulose Fibre Inorganic Composites for Depth Filtration and AdsorptionAysu Onur¹, Aaron Ng², Gil Garnier^{1*}, Warren Batchelor^{1*}

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Abstract

Depth type composite filters are porous materials heavily loaded with adsorbents and can remove contaminants from liquids by combining mechanical entrapment and adsorption. There is still a need for developing high performance filters by controlling the internal structure at micro and nano level. In this study, highly fibrillated nanocellulose (NC) with increased surface area was used as partial substitute for the fibre matrix to tailor the filter structure as well as the adsorption and filtration performance. Polyamide-amine-epichlorohydrin (PAE) was added both to adjust the charge of medium and provide wet strength. Filters were fabricated by embedding perlite particles into the cellulose fibre matrix by papermaking technique. The structure of composites was characterised for pore size distribution and surface morphology. Adsorption and filtration characteristics were quantified using two model dyes and silicon dioxide particles. Adsorption was found to be electrostatically controlled and dependent on the charge of the dye molecules and the filter medium. The addition of NC doubled the removal of a cationic dye by increasing the surface

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