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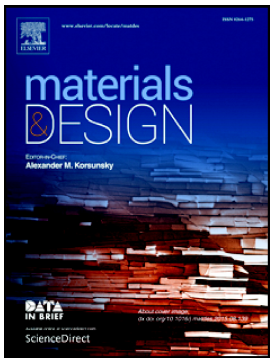

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Boron-chelating membranes based in hybrid mesoporous silica nanoparticles for water purification

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Abstract

Boron is a key element for some biological processes, used in extreme low doses. However, it becomes toxic for humans and plants in concentrations above a few ppm. We have design a new approach for boron scavenging, based in hybrid membranes of functional mesoporous silica nanoparticles immobilized in cellulose acetate. The mesoporous silica nanoparticles, with diameters around 150 nm, were functionalize with vicinal diol groups that complex boron very efficiently. The functional nanoparticles were covalently immobilized in a cellulose acetate membrane using a di-terminated alkoxisilane that react with the remaining silanol groups at the nanoparticles surfaces and with the hydroxyl groups of the cellulose. The functional nanoparticles and the hybrid membranes show boron removal efficiencies of phenyl boronic acid of up to 93%. The membranes can be used in multistage filtering systems, with sequential membranes modules in continuous operation, in a cheap, simple and efficient process for boron scavenging.

KEYWORDS: boron chelating membranes; mesoporous silica nanoparticles; hybrid membranes; boron removal; fluorescent sensing