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Abstract

Boron is biologically beneficial but only in trace quantities. It is hard to detect and remove from water, as sometimes required in the treatment of residual waters. We have designed an approach based on thermo-responsive polymer nanoparticles containing vicinal diol groups for boron scavenging. The particles have a core of poly(methyl methacrylate) (PMMA) and a thermosensitive shell with a brush composed of a copolymer of *N*-isopropylacrylamide (NIPAM), 2-aminoethyl methacrylate (AEMH), and either D-gluconoamidoethyl methacrylate (GAEM) or monodiol methacrylate (MDM) boron chelating monomers. The nanoparticles show boron removal efficiencies of up to 96%, with removal of phenylboronic acid being more efficient than that of boric acid. The best boron scavenging efficiency was obtained for the higher specific surface area particles containing D-gluconoamidoethyl groups. At temperatures above *ca.* 35^{o}C the particle shell collapses, inducing particle aggregation which allows simple separation and recovery of the nanoparticles. These can be subsequently used for boron scavenging, without loss of efficiency.

Keywords

Boron; Nanoparticles; Scavenging; Thermo-responsive; Water treatment