

Electrospun PVA Fibers as a Boron-selective Sorbent Media for Desalination

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A novel and efficient method to remove aqueous boron by using electrospun PVA (polyvinyl alcohol) fibers is proposed. The primary aqueous boron species, $B(OH)_3$ (boric acid), is expected to be chemically adsorbed on the surface of PVA fibers by the reaction with $-OH$ (hydroxyl) groups of PVA. Not to be dissolved in water, the fibers are treated in methanol. First, the adsorption of $B(OH)_3$ on PVA fibers was confirmed by the combined analysis of IR and Raman spectra. The peaks corresponding to the molecular vibration modes of chemically adsorbed boron and neighboring oxygens were clearly identified by the aid of harmonic frequency calculation from computation chemistry. Aside from this qualitative result, the equilibrium adsorption capacity of PVA nanofibers was quantitatively determined by using Carmine method, which is 0.0010~0.0025 g of aqueous boron per g of PVA mats. The PVA fibers prepared by a commercial electrospinning setup and a post-treatment in methanol, would be a good boron-selective sorbent media, possibly applied for desalination processes.