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Title : Application of Polyelectrolyte-Enhanced Ultrafiltration to the Removal of Arsenic from Aqueous Solution

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Polyelectrolyte-enhanced ultrafiltration (PEUF) is a membrane-based separation technique which can remove ions from aqueous solution. The PEUF process for removal of arsenic(V) from dilute aqueous solutions involves addition of cationic polyelectrolyte, poly(diallyldimethyl ammonium chloride) or QUAT or PDADMAC, to bind anionic arsenic species to form polyelectrolyte-arsenate complexes, which are separated by a subsequent ultrafiltration operation. The large QUAT-arsenate complexes are retained by the membrane in the retentate stream, while the purified water and ions which do not bind to the polyelectrolyte pass through the membrane as the permeate stream. Arsenic rejection experiments included variation of polyelectrolyte-to-arsenic ratio and pH, presence of background salts, and relative flux. Arsenic concentrations were determined using flow-injection hydride generation atomic absorption spectrometry. Arsenic rejection increased with increasing pH and polyelectrolyte-to-arsenic ratio. Arsenic was 99-99.9% removed from synthetic feed water containing 100 μg/L As. The arsenic rejection is found to decrease with increasing salt concentration. The magnitude of rejection reduction due to the presence of salt decreases in the order $SO_4^{2-} > HPO_4^{2-} > H_2PO_4^- > HSiO_3^- > Cl^- > HCO_3^-$ at the same molar concentration of these salts. Arsenic retention increased and relative flux decreased with increased polyelectrolyte concentration in the retentate.

The safe drinking water act requires United States Environmental Protection Agency (USEPA) to revise the existing 50 μg/L standard for arsenic in drinking water. In October 2001, the USEPA decided to move forward with implementing the new 10 μg/L standard for arsenic in drinking water to be effective in 2006. The concentration of arsenic(V) in aqueous solution was reduced from 100 μg/L to less than 5 μg/L by PEUF.