

Synthesis & characterization of ion imprinted polymer for arsenic removal from water: A value addition to the groundwater resources

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ABSTRACT

In this study, ion imprinted polymer (As(III)-IIP) was synthesized using allylthiourea as a functional monomer and As(III) as a template in removing As from water. The synthesis of As(III)-IIP as a sorbent was prepared via bulk polymerization. The characterization study has been conducted included pre-polymerization study by using Proton Nuclear Magnetic Resonance (¹H NMR); Fourier Transform Infrared (FTIR) analysis, saturation study and pH effects with Inductively Couple Plasma-Mass Spectrometer (ICP-MS) as an instrumental detection. FTIR analysis was done to differentiate spectra between As(III)-IIP; and NIP as a control. From pre-polymerization study, the nature of bonding complexation was selective towards sulphur atoms and hydrogen atoms. A moiety of amino acid at functional sites of As(III)-IIP contributes to the selective properties between sulphur atoms and arsenite. In addition, reduction process occurred during adsorption and change from arsenite to arsenate which produce less toxic compounds. From ¹H NMR spectra, AT has the largest interaction energy towards the As(III) as a template in a mixture of 0.5 M AT. Downfield chemical shifts occurred from 6.68 ppm to 7.01 ppm and from 6.13 ppm to 6.32 ppm respectively. The formation of thioarsenic complex was obtained from this study. In the saturation study, the total capacity loaded reached until 0.0679 mmol/g for 25 mg/L of initial arsenite. The specialty of As(III)-IIP among other sorbents, As(III)-IIP able to recover the arsenite from aqueous media. At pH 7, As(III)-IIP works as a good sorbent at high percentage of removal (90%). In the FTIR spectra, there is no significant differences in NIP and As(III)-IIP as a sorbent. As a conclusion, As(III)-IIP would be a great alternative methods for As removal from water.

KEYWORDS: Ion imprinted polymer Arsenic removal

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