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A novel amidoxime-modified poly acrylonitrile grafted wheat starch and its removal capacity towards nickel and copper (ii) ions

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Polyacrylonitrile (PAN) is an ideal polymeric matrix for adsorption purpose due to its tolerance to most solvents, thermal stability and abrasion resistance. In this study, active nitrile group was converted into amidoxime functional group to form a chelating sorbent. The selection of wheat starch (WS) to enhance adsorption capacity of PAN-based sorbent is an advantage due to its high availability. Thus, the AN was grafted onto WS and subsequently modified with hydroxylamine to produce a novel chelating ion-exchange sorbent with enhanced efficiency to capture Cu(II) and Ni(II) ions in aqueous solution. Poly(acrylonitrile-grafted-wheat starch) (poly(AN-g-WS)) were then chemically modified with hydroxylamine hydrochloride (NH2OH.HCl) to convert the nitrile groups into amidoxime functional groups. Batch adsorption was performed to identify the binding property of Cu(II) & Ni(II) ions . The influence of pH, contact time, adsorbent dosage and initial metal concentration during adsorption of Cu(II) & Ni(II) ions onto amidoxime-modified poly(AN-g-WS) was carried out. The optimum adsorption capacities of amidoxime-modified poly(AN-g-WS) were 53 and 45 mg.g-1 respectively at pH 5. The adsorption data was well fitted with the Langmuir model. The study showed that the optimum time required for the Cu(II) & Ni(II) ions to attain saturation level was 1 hour. The adsorption kinetic models pseudo first order and the pseudo second order were employed to interpret the adsorption data.

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