

POLY (ACRYLIC ACID)/SAWDUST COMPOSITE FOR ADSORPTIVE REMOVAL OF SELECTED HEAVY METAL IONS FROM AQUEOUS SOLUTIONS

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The synthesis of a novel adsorbent by grafting poly (acrylic acid) to sawdust to remove heavy metal ions from aqueous solutions is reported here. The ability of sawdust to adsorb heavy metal ions can be enhanced by grafting poly (acrylic acid) which increases the negative charge on the composite, making it a better adsorbent than sawdust. Poly (acrylic acid) was synthesised using potassium persulphate as the initiator by free-radical polymerisation of acrylic acid. *In-situ* polymerisation of acrylic acid on sawdust yielded the poly (acrylic acid)/sawdust composite (PAA/SD). Fourier Transform Infrared Spectroscopy (FTIR) was used to characterise sawdust, poly (acrylic acid) and PAA/SD. X-ray Fluorescence (XRF) was used to determine the metallic constitution of sawdust. The adsorption percentage of PAA/SD towards Pb^{2+} , Ni^{2+} , Cd^{2+} , Zn^{2+} and Cr^{3+} was determined under conditions of a pH of 6, 60 min of shaking time, 60 min of settling time, (0.100 ± 0.001) g dosage of PAA/SD composite of particle size of 200 μm which was determined using a sieve plate. The procedure was repeated twice. The concentrations of heavy metals were determined using atomic absorption spectroscopy. Results indicate the successful synthesis of poly(acrylic acid) by free radical polymerisation of acrylic acid with a yield of 42%. FTIR characterisation affirms the synthesis of PAA/SD composite. XRF characterisation proves the absence of heavy metals tested in the analysis in sawdust, validating the sawdust sample used for composite preparation. The PAA/SD exhibited adsorption percentages of 51% for Pb^{2+} , 40% for Ni^{2+} , 60% for Cd^{2+} , 57% for Zn^{2+} and 55% for Cr^{3+} under the conditions studied. PAA/SD showed the highest adsorption towards Cd^{2+} . The novel PAA/SD composite is very effective in removing all tested heavy metals from aqueous solutions.

Keywords: Adsorption, Composite, Heavy metals, Poly(acrylic acid), Sawdust