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SOFT TEMPLATE-LESS ASSEMBLY OF A SHEATH OF NANOSTRUCTURED POLYANILINE ON LIGNOCELLULOSIC COIR FIBER: AN APPROACH TO A POROUS COMPOSITE SYNTHESIS BY *IN-SITU* POLYMERISATION

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A synthesis approach for a composite of polyaniline nanoparticles & naturally derived coir fibre (nPAni@Cf) was designed by optimising the processing parameters in the *in-situ* chemical polymerisation of aniline without a soft template. The aim was to develop a facile synthesis route that guaranteed the scalability and purity of the synthesised composite, which would function effectively in carcinogen remediation. The affinity of Cd(II) > Ni(II) > Zn(II) > Mn(II) >> $HAsO_2$ shown to the PAni & fibre composite was found to transcend in this sequence during competitive adsorption at pH 5.00 and 7.00. Variations in aniline and HCl concentrations, oxidant to aniline molar ratio (OX/AN), activation time of the fibre, and the duration of synthesis through classical vs rapid polymerisation technique were observed to impact the adsorption property of the hybrids tested in Cd(II) uptake experiments. The average dimension and size distribution of PAni adjoined to the fibre were resulted to be greater when synthesised conventionally compared to the rapid technique at 3.00 hours. However, in traditional synthesis, via adding the oxidant gradually, PAni was firmly resolved, embodying orderly into an outer layer on the composite. nPAni@Cf was fabricated by activating the fibre in a highly acidic HCl dopant medium containing 40 mM of aniline monomer, *in-situ* polymerised by applying the oxidant at an OX/AN of 0.25. Aniline was successfully polymerised, forming a porous immobilisation of PAni overlaid by the fiber in the porous structured nPAni@Cf, characterised by ATR and SEM analysis. The synthesis was routinely shaped PAni into a spherical form, miniaturised to an average diameter of 37 nm during the determined growth of PAni particles, conveniently ruled in an acidic medium. This methodology, which was adapted via the 'synthesis optimisation strategy,' provided a non-complex, and additive-free pathway guide for assembling nanostructured polyaniline into the easily separable macro-sized nPAni@Cf.

Keywords: Adsorption, Composite, In-situ synthesis, Nanoparticles, Polyaniline