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Sorption of polluting metal ions on a palm tree frond sawdust studied by the means of modified carbon paste electrodes

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Abstract

Water remediation by adsorption of the metal ions on a low cost sorbent is the frame of the present study. The metal ions adsorption properties of sawdust of palm tree fronds (PTF sawdust) are investigated by both equilibrium measurements and modified carbon paste electrode. The ability to adsorb Cu(II), Cr(VI) and As(III) in significant quantities is demonstrated. Carbon paste electrodes modified by incorporation of PTF sawdust (PTF-CPE) or, for comparison, an organically modified silica for the detection of copper(II) are investigated in term of sensitivity, estimation of number of possible reuses, repeatability and interference effect. A detection limit for Cu(II) analysis of $1.0 \cdot 10^{-8} \text{M}$ has been achieved after 5 min preconcentration and a single PTF-CPE can be used for up to 10 preconcentration-analysis-regeneration cycles. The relative standard deviation (n=9) for the determination of a 10^{-6}M Cu(II) solution (pH=5) was about 26%. The effects of Ca(II), As(III) and Cr(VI) on the copper detection are investigated : calcium ions were shown to compete with copper on the same adsorption sites, arsenic(III) has no effect on the copper detection whereas chromium(VI) was shown to enhance the copper detection.

Keywords : adsorption, bio-sorbent, copper(II), arsenic(III), chromium(VI), carbon paste, sawdust, Palm Tree Frond

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