NANOCELLULOSE-BASED COMPOSITES FOR THE REMOVAL OF HEXAVALENT CHROMIUM FORM DRINKING WATER

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ABSTRACT

Inorganic phases known for their efficiency to remove heavy metals were combined with nanosized cellulose to produce biocompatible composites which preserve a high purification potential. Iron oxide nanoparticles (magnetite, Fe_3O_4) and tin hydroxychloride microspheres (abhurite, $Sn_{21}O_6(OH)_{14}Cl_{16}$) were synthesized by the aqueous precipitation of corresponding Fe(II) and Sn(II) salts. The nanocellulose composites were prepared after the high-energy wet blending of the obtained precipitates with fine powder of the nanocellulose in various ratios (10-50 %wt. in inorganic phase). Materials characterization indicates the successful incorporation of both active phases into the nanocellulose matrix and the high homogenization of the composite. According to the electron donation ability of Fe_3O_4 and abhurite, the composites were evaluated for their efficiency to remove hexavalent chromium from natural water. Adsorption isotherms indicate that nanocellulose contributes to an improvement of the specific capacity when featured with Fe_3O_4 nanoparticles whereas the efficiency of pure abhurite is almost preserved in the corresponding composite materials when inorganic content is at least 30 %wt. Such findings indicate the possibility to extend the use of these inorganic phases to purification applications where minimum toxicity is a requirement while the magnetic characteristics of Fe_3O_4 nanoparticles facilitate the magnetically-driven recovery at the end of the process.

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