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Topic of Research: Synthesis, characterization, and applications of chemically modified metal based nanosorbents

Findings

In the present thesis work, the development of chemically modified metal based nanosorbents are applied for the elimination of toxic organic dyes and heavy metal ions from wastewater. The thesis consists seven chapters. The first chapter starts with the general introduction of the topic, types of water contaminants, Sources, limits, and human health impacts of wastewater. The urgence of Chemical modification of metal oxides (CMMOs) has also been elaborated. The second chapter deals with the principles and techniques for characterization used in this thesis. The chapter discussed the synthesis methods adopted in coming chapters and the characterization techniques used with their principles and methodologies. This thesis work covers the synthesis of chemically modified metal based nanosorbents using the co-precipitation, Modified Hummer's, hydrothermal, Solvothermal techniques. These as-synthesized metal-based nanocomposite materials were characterized with the help of FTIR, XRD, XPS, SEM, TEM, VSM, zeta potential, TGA-DTA and EDAX techniques. In the case of Reduced graphene oxide-based metal nanoadsorbent, the capturing of various organic dyes including Methyl orange (MO; qmax: 1666.6 mg/g), Congo red (CR; qmax:1000 mg/g), Brilliant green (BG; qmax: 416.6 mg/g has been successfully reported. On the other hand, Reduced Graphene oxide cobalt ferrite and Nickel ferrite (RGCF & RGNF), Activated carbon cobalt ferrite (ACCOF) has also been reported to successfully remove divalent metal ions including As^{2+}, Hg^{2+} and Pb^{2+}, Sr^{+2} from wastewater. In addition, CTAB assisted Manganese ferrite (CTAB/MnF) were studied for the removal of Crystal Violet dye (CV; qmax: 238 mg/g).