Faculty of Science

Chemistry Department

Synthesis, characterization and analytical applications of some nanoparticles

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Synthesis, characterization and analytical applications of some nanoparticles

A Thesis

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Ziad Fathy

Aim of the work

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The aim of this work was to synthesize nano metal oxide to solve some problems of wastewaters treatment by removal of toxic heavy metals, especially chromium and copper in aqueous systems.

The first part of this thesis deals with the synthesis and characterizations of Fe_3O_4, magnetite, Al_2O_3 alumina and Fe_2O_3 hematite as nanoparticles adsorbent. X-ray diffraction (XRD) and transmission electron microscopy (TEM) were used to identify the morphologies and particle sizes.

The second part of this thesis concerned with the effect of different parameters on the adsorption including contact time, initial and final Cr (VI) ion concentration, solution pH, and adsorption kinetics models and Adsorption isotherm

Summery

Summery

The aim of this study was to synthesize some nano metal oxide to solve some problems for the treatment of heavy metals, especially Cr (VI) and Cu (II) in aqueous systems by adsorption method .Alumina, Hematite and magnetite were synthesized by three different methods (sol-gel, forced acid hydrolysis and reverse Co-precipitation) to be used as nano-adsorbent for chromium and copper in aqueous solution

Nano adsorbents were characterized by X-ray diffraction (XRD) and transmission electron microscopy (TEM) to identify the morphologies and particle sizes. (BET) to determine particles surface area and pore average diameter

Analytical Assessment of Cr (VI) and Cu (II) were carried out based on their reaction with 1, 5 diphenylcarbazide (DPC) and 4(2-thiazolylazo) resorcinol respectably, following standard methods for the examination of water and waste water.

Different factors effects on adsorption efficiency were studied such as:

- Contact time
- Adsorbent dose
- pH
- Initial concentration of adsorbate
- Adsorption kinetics
- Adsorption isotherms

Recommended conditions at which nano-adsorbent acts with highly efficiency were obtained.

It is clear from these studies Alumina, Hematite and magnetite can be used as low cost adsorbent for chromium and copper removal from aqueous solution with high efficiency.

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