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تحضير جسيمات نانوية مختلفة وحقنها بمواد مختلفة لتعزيز أمتزاز صبغة الايوسين الصفراء

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إعداد

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Chapter One
(Introduction)

1.1 Introduction

Nanotechnology has become one of the most interesting areas of scientific research in the past few years. The nanotechnology is receiving much attention in material research, including synthesis, characterization and applications of Nano-meter sized metals, oxides, semiconductors and ceramics[1]. This is due to an increase in reactivity when compared to their micro-sized counterparts since Nano scaled materials exhibit larger surface to volume ratio which provides unsaturated and thus, more reactive surface atom. The most common nanoparticles (NPs) made of transition metals, silicon, carbon, and metal oxides. It can be produced through either chemical or physical means[2].In chemical synthesis the NPs is growing field with a great potential to making useful materials[3]. However, this has potential hazards to health and environment.

The green synthesis has been emerged as one of the active areas of research. Green synthesis of NPs has several advantages over chemical synthesis, such as simplicity, reduce generated hazardous waste, cost effectiveness as well as compatibility for biomedical and pharmaceutical applications[4] [5]. The development of systematic methods for the synthesis of metal oxide nanostructures is still a challenge for academic and industrial research, but considerable efforts have been devoted during the last decade to improving the usual methods of synthesis[6]. Many researchers have reported the biosynthesis of metal nanoparticles by plant leaf extracts and their potential applications[7] [8].

Owing to presence highly active bio-organic molecules in plants, eco-friendly plant-based methodologies such as roots, flowers, seeds, leaves, bark, and fruits, have emerged as extremely promising biological factories for the formation of the diverse range of inorganic[9].

Extracts from plants may act as both reducing and capping agents in nanoparticle synthesis. The bio reduction of metal nanoparticles by combinations of biomolecules found in plant extracts (e.g. enzymes, proteins, amino acids, vitamins, polysaccharides, and organic acids such as citrates) is environmentally benign, yet chemically complex. The properties of the plants extract such as its concentration, metal salt concentration, reaction time, reaction solution pH, and temperature significantly influence the quality, size, and morphology of the synthesized nanoparticles [10].

Many studies impregnated NPs with different materials such as (activated carbon, graphene, silica, agricultural waste etc.) to enhance their efficiency for water treatment [101] [102]. Activated carbon is a very diverse adsorbent material including a high degree of porosity and high surface area, while up to 90% of it may be constituted from carbon[11]. Activated carbon and carbon nanotubes (CNTs) are a porous carbonaceous material with continually expanding applications in water treatment and desalination, wastewater treatment due to its unique characteristics[12] [103]. However, their highly cost to use [13]. On the contrary, biochar is a low cost and renewable adsorbent produced from through pyrolysis available biomass at ≥700 ^{0}C under absent or low oxygen. Many types of feedstock have been used for producing biochar such as plant residues and animal manures. The feedstock types are effected the characterization and efficiency of biochar for removal pollutants [104]. Corncobs residual are the feedstock available in Iraq. The corncob will be used in this research, for biochar production to investigate as carbonaceous low cost material for removal dye from water.

The general objective of this study was to developed a green method of Mn_3O_4 or Cr_2O_3 nanoparticles impregnation on different adsorbents (activated carbon, Biochar, carbon nanotubes) using Olive leaf extract and to evaluate their action for removing eosin yellow dye from water. Therefore, in this study we investigate and compare

different carbonaceous materials as adsorbents to evaluate their effectivity for removal dye from water with/without impregnated with NPs.

1.2 Aim of study

1. Preparation of biochar using vegetable waste.

2. Preparation of Mn_3O_4, Cr_2O_3 nanoparticles using an environmentally friendly method.

3. Preparation of a binary composite (Mn_3O_4/MWCNTs, Cr_2O_3/MWCNTs, Mn_3O_4/AC, Cr_2O_3/AC, Mn_3O_4/biochar and Cr_2O_3/biochar.

4. Studying adsoprtion of yellow eosin dye from`aqueous solution under different conditions such as contact time, effect of temperture and adsorbent weight.

5. Studying effect role of the MWCNTs, AC and biochar materials on the Mn_3O_4 and Cr_2O_3 nanoparticles in enhance the yellow eosin dye adsorption.

6. Study the thermodynamic functions of adsorption processes

7. Investigate the kinetic studies of adsorption process.