بسم الله الرحمن الرحيم

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شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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Novel Zinc Oxide Nano Photocatalysts for Simulated Wastewater Treatment

A thesis Submitted to

Chemistry Department
Faculty of Science-Ain Shams University
As a partial fulfillment of the requirements for the Master degree of Science
(Chemistry)

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English summary

Pollution in general and water pollution in particular are among the most important problems facing the environment. This pollution has caused by the urgent need for industry due to the steady increase in the population therefore; most scientific research concerned with this problem. In recent years, ZnO is the most important photocatalyst, due to its non –toxicity, availability, stability, photocatalytic activity and cheapness. Unfortunately, it has two disadvantages. The first one, is fast recombination of electron-hole. Second, large energy gap (3.37 eV) causing its photocatalytic activity limited in UV region of solar light spectrum which represents 2-3%. Several methods have been used to overcome these disadvantages, including metal doping, and non-metal doping, and the coupling of another semiconductor with a low energy difference such as CuO. **In the first part of this thesis**, a pure Zinc oxide was prepared by aqueous sol-gel method to test its activity under UV-A irradiation in degradation of fluorescein dye as a model for anionic dyes. Some of the parameters that affect the photocatalytic activity of zinc oxide, such as pH, zinc oxide dose , and the fluorescein dye concentration, are studied. In addition, different scavengers are used to identify the most active species in photodegradation process, and the mechanism of photodegradation of fluorescein dye using ZnO is suggested.

In the second part, copper oxide was coupled with zinc oxide semiconductor at different rates (0.5%, 1%, and 2%) to improve the photocatalytic activity of zinc oxide to be active under visible light. It is found that the best ratio of copper oxide to be coupled with ZnO is 1% for degradation of the fluorescein and rhodamine B dyes exist in the

contaminated water under visible irradiation. In addition, some parameters that affect photocatalytic activity are also studied like pH, CuO/ZnO dose, scavenger, and dye concentration effect. Moreover, a real textile dye (reactive black B) was used as real wastewater pollutant, which is extracted from the dying bath directly after the dying process, and was used to identify activity of zinc oxide and 1% CuO/ZnO under visible light.

The skeleton of the thesis is divided into four chapters:

Chapter1: Introduction

This chapter involves the problem of pollution, especially water pollution and its dangerous effect on human beings. The traditional and advanced methods for wastewater treatment are included. In addition, several methods of preparation of nanoparticles are presented, and at the end of this chapter a recent literature survey at scope of the thesis works was presented.

Chapter2: Experimental

This chapter contains detailed description of chemicals, experimental conditions and method of preparation of ZnO and CuO/ZnO nanoparticles. Also, this chapter includes the apparatus are used in characterization.

Chapter 3: Results and discussion

This chapter involves the explaination of experimental results and physicochemical characterizations of as-prepared photocatalyst

nanoparticles. Also, the mechanism of photodegradation process is involved.

Chapter4: Conclusion

Finally, in this chapter, the summary of our presented work and future trends are included.

Appendix 1,2: Includes all kinetic data

Appendix 3: Published paper**.**

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