SYNTHESIS OF MESOPOROUS ZnO NANOSTRUCTURES DECORATED WITH GOLD NANOPARTICLES AND THEIR USE AS PHOTOCATALYST

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ZnO is a semiconductor compound with wide direct band gap (3.37 eV), large exciton binding energy (60 meV), and thermal and chemical stability under harsh environments. In nanometric size, ZnO has a large surface-volume ratio, which makes it an attractive candidate for applications in heterogeneous catalysis, gas sensing, bio-sensing, cosmetics, drug delivery, energy storage and solar cells. In the catalysis field, ZnO is considered an effective, inexpensive and non-toxic semiconductor photocatalyst. In this regard, nanosized ZnO has been used successfully for treatment of wastewater containing a wide range of organic chemicals and synthetic dyes. Nevertheless, a major limitation of achieving high photocatalytic efficiency of nanosized ZnO is its characteristic fast recombination rate of photogenerated charge carriers. In order to overcome this difficulty, the fabrication of composite materials including semiconductor-metal junctions, which could inhibit the recombination of charge carriers, has been proposed. Therefore, there is a huge interest to develop reliable techniques for obtaining metal-semiconductor compounds based in nanostructured ZnO.

Here, we report, the synthesis of mesoporous ZnO nanostructures decorated with gold nanoparticles (Au-NPs) and their catalytic performance. The nanostructured ZnO was obtained by thermal decomposition of ZnO₂ nanopowders synthesized through a microwave-assisted hydrothermal method, following by deposition of Au-NPs on their surface using the Turkevich method. The obtained Au/ZnO nanocomposite was characterized by x-ray diffraction, scanning electron microscopy, diffuse reflectance spectroscopy and nitrogen adsorption-desorption. The results revealed that the obtained material is high crystalline and that the Au-NPs are deposited homogeneously on the ZnO surface. Finally, the photocatalytic activity of the nanocomposite was evaluated in the degradation of Rhodamine B dye, demonstrating that Au-NPs enhance the photocatalytic efficiency of the obtained ZnO nanostructures.

Keywords: Au/ZnO, nanocomposite, photocatalysis

References:

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