conference Details and Registration
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Important Dates
April 15th - Registrations open
May 30th - Submissions deadline
June 13th - Acceptance

Support

Credit of photos: Leonardo Schara
Co/Mn-doped ZnO for photocatalytic degradation of Rhodamine B (RhB)

G. V. F. Santos1*, M. A. M. Lucena1, C. Ribeiro2, T. R. Giraldi3, I. T. Weber4
1Universidade Federal de Pernambuco, Recife, PE, Brazil
2Embrapa Instrumentação Agropecuária, São Carlos, SP, Brazil
3Universidade Federal de Alfenas, Poços de Caldas, MG, Brazil
4Universidade de Brasília, Brasília, Distrito Federal, Brazil

Zinc oxide is a semiconductor that has been used as an effective photocatalyst for decolorization of organic dyes such as Rhodamine B [1] and methylene blue [2]. This material has a band gap of 3.2 eV (λ < 387 nm) and is much used in photocatalysis using UV radiation. The doping of ZnO enables the semiconductor to extend its absorption wavelengths of the UV to the visible region (λ > 400 nm) by modifying its band gap.

In this work, ZnO was doped with cobalt or manganese by precipitation method [3] in proportions of 0.25, 1.0 and 5.0 mol%. Zinc acetate, cobalt acetate and manganese acetate were used as precursors. The powders of ZnO doped with cobalt or manganese, were annealed at 500°C for 2h. The samples were characterized by XRD, SEM, FTIR, and UV spectroscopy in reflectance mode. The XRD results showed that for all compositions, only the ZnO phase (JCPDS 36-1451) was observed. No changes in lattice parameters (a=b=3.25, c=5.21) nor surface area and crystallite size was observed as function of doping (S_{average} Co=14 m^2 g, D_{XRD} Co=33 nm, S_{average} Mn=11 m^2 g, D_{XRD} Mn =32 nm). The curves of FTIR show the presence of intense Zn-O bands, but no signal of Co-O or Mn-O was found. SEM images show the formation of pseudo-spherical particles and aggregate of various sizes.

Although no major structural changes of the particles, the absorption curve in UV-Vis spectroscopy showed that the energy gap decreased with the addition of dopant (3.55 to 3.20 eV for the ZnO:Co^{2+} and 3.47 to 3.37 eV for the ZnO:Mn^{2+}).

Photocatalytic tests using ZnO:Co^{2+} and ZnO:Mn^{2+} were made in batch reactor equipped with mercury 3 lamps Philips 15W (UV-C, 254nm) with a 2.5 ppm RdB solution. The ZnO:Mn^{2+} samples showed degradation percentages between 78 and 96% and for the ZnO:Co^{2+} samples the percentage was 64 and 96%. This result is similar to the ZnO pure which showed a percentage of 96%.

Keywords: photocatalysis, ZnO, doped, band gap, rhodamine B

Work supported by Facepe, CNPq.


georgia virginia@yahoo.com.br
Av. Prof. Luiz Freire, s/n Cidade Universitária, 50670-901, Recife-PE Phone: (81) 2126-8412