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PHOTOCATALYTIC ACTIVITY OF ZnO-PEO COMPOSITES

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The removal of organic pollutants from wastewater is very important for environmental protection. During the years different methods have been developed and applied on wastewater treatment. Between those methods a heterogeneous photocatalysis has received extensive attention since it allows a complete mineralization of pollutants. ZnO-based materials has established role in heterogeneous photocatalysis. However, major drawback of ZnO is a band energy gap of 3.37 eV (368 nm) which restricts the material to absorb only UV light. Since sunlight is a source of clean and cheap energy, where UV light makes no more than 3–5% while visible light is about 45% of the total sunlight, it is highly desirable to synthesize ZnO-based materials capable for visible light photocatalysis. To modify the optical absorption properties and improving the visible light photocatalytic activity of ZnO materials several approaches have been applied: (1) metal ion doping, (2) nonmetal doping, (3) defect induced doping, (4) surface sensitization of ZnO particles to extend the spectral response into the visible region, (5) band gap modification by creation of oxygen vacancies and oxygen sub-stoichiometry, etc.

In this study, ZnO powder with nanospherical morphology was synthesized by microwave processing. In the continuation, the synthesized powder was used for preparation of composites with polyethylene oxide (PEO). PEO powders with three different molecular mass (200.000, 600.000 and 900.000) were used for composites preparation. The phase purity and crystal structure of the composites were investigated by X-ray diffraction and Raman spectroscopy. The particles morphology and size distributions were studied by FE–SEM and laser diffraction particle size analyzer, respectively. The optical properties were studied using UV–Vis diffuse reflectance and photoluminescence spectroscopy. The photocatalytic activity of ZnO-PEO composites was examined *via* decomposition of methylene blue (MB) under direct sunlight irradiation. A large efficiency of MB degradation was found after 6 h of irradiation. An enhanced optical and photocatalytical properties of ZnO-PEO composites were attributed to: (1) lattice defects introduced in crystal structure of ZnO by fast microwave processing, and (2) surface sensitization by polyethylene oxide (PEO).