SIMULTANEOUS PHOTOCATALYTIC ACTIVITY OF ZnO IN A DYE MIXTURE (METHYLENE BLUE, RHODAMINE B AND METHYL ORANGE)

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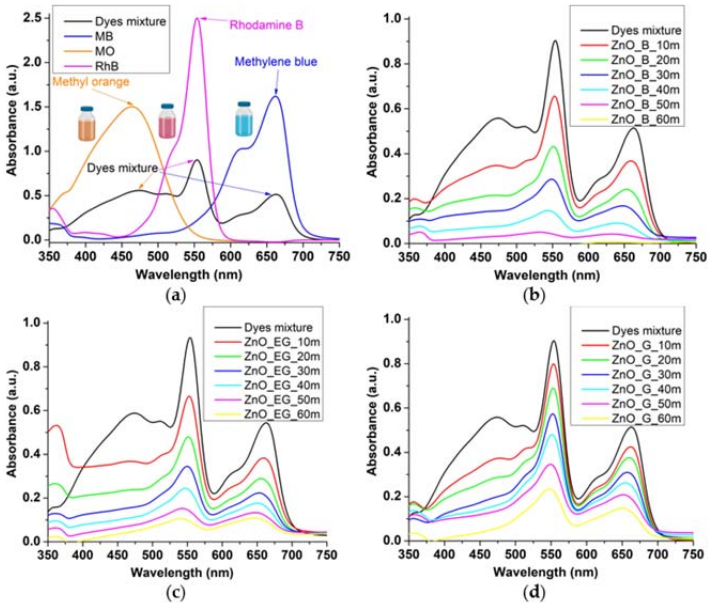
Among nanomaterials, ZnO (zinc oxide) presents some remarkable properties like antimicrobial or photocatalytic activities under ultraviolet (UV) or visible light irradiation. These properties recommend ZnO for various applications like: antimicrobial textiles, wound dressing composites, food packaging or water disinfection. The properties of ZnO are influenced by the size and morphology of the nanoparticles (NPs), but also by the surface defect density, purity and presence of doping elements. In this paper, we report the ZnO NPs synthesis by forced solvolysis in alcohols. We study the influence of alcohol type (n-butanol, ethylene glycol and glycerin) on the size, morphology and properties of ZnO NPs. The smallest polyhedral NPs (<30 nm) were obtained in n-butanol, while in ethylene glycol the NPs measured on average 44 nm and are rounded. Polycrystalline particles of 120 nm were obtained in glycerin, followed by water refluxing.

Water is never polluted by just a single substance, but the literature is scarce in reports made on systems that contains more than two pollutants. We report here the photocatalytic activity against a dye mixture, of three model pollutants: methyl orange (MO), methylene blue (MB) and rhodamine B (RhB). All samples exhibited good photocatalytic activity against the dyes mixture, with degradation efficiency reaching even 99.99 %. The sample with smallest nanoparticles maintained a high efficiency > 90%, over five catalytic cycles. The antibacterial tests were conducted against Gram-negative and Gram-positive strains. The ZnO samples presented strong inhibition of planktonic growth for all tested strains, indicating that they can be used for antibacterial applications like water purification.



Absorption spectra for individual dyes, methylene blue (MB), Rhodamine B (RhB) and methyl orange (MO) and for dyes mixture (MB+RhB+MO), with indication of the corresponding absorption maxima (a); photocatalytic activity of ZnO_B (b), ZnO_EG (c), ZnO_G (d) samples against dyes mixture

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