

Cobalt codoped silver-zinc oxide micro-particles for photocatalytic degradation of textiles dyes under sunlight

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Co co-doped Ag-ZnO, ZnO, and Ag-ZnO micro-particles with different Co percentage (Co wt%) using a solvothermal method were synthesized and their photocatalytic power towards the degradation of textile dyes was investigated. Fe-SEM images confirmed that 3 wt % Co-Ag-ZnO particles adopted the cauliflower shape crystals in the micro-scale while EDS spectrum confirmed its purity. The lowest bandgap energy, 3.26 eV, was also obtained for the 3 wt % Co-Ag-ZnO compound promising its use as a potential photocatalyst for dye degradation. Photocatalytic degradation of the textile dye Reactive Black 5(RB5) under sunlight in the presence of synthesized particles was investigated with a different set of conditions to understand the effect of catalytic dosage and the pH of the medium using the bare dye solution as the controller. The photodegradation was carried on sunny days between 9.00 am-2.00 pm with the average solar intensity around 3500 ± 100 lux. As expected based on the bandgap energy, 0.003 g of the 3 wt % Co co-doped Ag-ZnO in 60 ppm of RGB5 dye concentration showed the highest dye degradation reaching the 100 % within 2.5 hours at pH = 4. The reusability/stability was more than 50% dye degradation after three consecutive cycles at pH 4. Therefore this study reveals that the Co co-doped Ag-ZnO with the optimum Co percentage of wt 3% is a potential candidate for the degradation of RB5 textile dye, and hence it is an effective and safer method for the treatment of wastewater contaminated with RB5 textile dye.

Key words: *ZnO micro particles, photocatalysts, photodegradation, Co co-doped Ag-ZnO, ZnO bandgap*

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