## Application of biogenic zinc oxide nanoparticles in the degradation of organic dyes

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Heterogeneous photocatalysis is one of the most popular methods among the variety of different technologies to purify environmental pollutant. The dye Rhodamine B and Alizarin Yellow R are used in many industrial applications and have side effect, when significant amount of the dye is washed off with the wastewater of production during the process, falling into surface reservoirs and destroying the ecosystem.

Metal oxides as a multifunctional material are non-toxic, biocompatible, and have high activity. Metal oxide semiconductors have good photocatalytic activity for decomposition of organic dyes. In particular, zinc oxide can be considered as the most important among all the various metal oxides because of the wide band-gap (3.36 eV) and high exciton binding energy (60 MeV) as well high thermomechanical stability.

This work investigated the possibility of using biogenic zinc oxide nanoparticles (NPs) ZnO as photocatalysts for the decomposition reaction of RhB and AYR dyes. The photoactivity of the catalyst in relation to the reaction of AYR and RhB was revealed: the effect of the dye concentration, temperature, and mass of catalysts were examined.

The photoreaction showed that the efficiency of dye removal increases with increasing irradiation time. The kinetics of the photodegradation reaction expressed a pseudo-reaction of the first order. An increase in the dye concentration reduced the efficiency of dye removal. The optimal mass of the RhB catalyst is 100 mg decomposition 98%, AYR 50 mg 97%, while the optimal concentration of dyes: RhB 5 mg/l reaction rate constant 0.0101 $min^{-1}$, AYR 10 mg/l k= 0.0204 $min^{-1}$. To study the effect of temperature on the efficiency of the decomposition of dyes, the experiment was carried out in the temperature range of 15-45 ° C. The activation energy for RhB was determined by Arrhenius equation to be equal to 12.3 kJ/mol, AYR $E_a$ equal to 11.63 kJ/mol.