VISIBLE-LIGHT PHOTOCATALYSIS OF AZO DYES USING COPPER(II) COORDINATION POLYMERS

Ildiko Buta, Maria Andreea Nistor, Simona Gabriela Muntean*

"Coriolan Drăgulescu" Institute of Chemistry, Bdul Mihai Viteazu no. 24, Timişoara, Romania
E-mail: sgmuntean@acad-icht.tm.edu.ro

The growing awareness of water pollution problems has been the main cause for the development of new technologies and methods of wastewater treatment with the main purpose to reduce the negative impact on the environment [1]. Photocatalysis proved to be a promising tool for the production of hydrogen fuel, generating electricity from solar cell systems but also for the degradation of pollutants like dyes, phenols, pesticides and antibiotics [2]. Three copper(II) coordination polymers, namely $^{1}_{\infty}[Cu_3L_2(N_3)]CH_3COO$ (**1**), $^{1}_{\infty}[Cu_3L_2(NO_3)]NO_3 \cdot 2MeOH \cdot 2H_2O$ (**2**), and $^{1}_{\infty}[Cu_3L_2(H_2O)](ClO_4)_2$ (**3**), (H_2L = N,N'-bis[(2-hydroxybenzilideneamino)propyl]-piperazine) [3] were investigated for the degradation of Acid Orange 7 (AO7) and Methyl Orange (MO) dyes, under irradiation with visible light. Dye concentrations before and after irradiation were determined by UV/vis spectrophotometry, by measuring the absorbance at the maximum wavelength of the dyes, and with these data the photodegradation efficiency was calculated. The influence of the hydrogen peroxide presence, reaction time, and dye concentration on the photodegradation efficiency of AO7 and MO was investigated. The obtained results with and without H_2O_2 under visible light irradiation, highlights the fact that the removal efficiency of AO7 and MO increased slightly in the presence of hydrogen peroxide.

The photodegradation efficiency decreases and the necessary time for the degradation process increases with increasing concentration of the dye solutions. The kinetic of dyes photodegradation was investigated using the Langmuir-Hinshelwood model and the obtained results showed that the degradation process followed a pseudo-first-order kinetic. The excellent stability of the copper(II) coordination polymer after the photodegradation process of dyes was demonstrated by the consistency of the initial and final structure of the complex. A photocatalytic oxidation mechanism was proposed, for the AO7 and MO photodegradation.

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