THE STUDY OF PHOTOCATALYTIC DEGRADATION OF ANIONIC DYES BY 1D COORDINATION POLYMERS BASED ON CADMIUM(II)

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Abstract

Organic dyes resulted from industries such as textile, food, printing, and pharmaceuticals are the main contamination in wastewater. [1] In the last years, several physical, biological and chemical methods have been investigated for the treatment of industrial colored wastewaters. Among them, photocatalysis proved to be a useful method due to the degradation of colored pollutants into smaller, non-toxic compounds. [2] Coordination polymers may exhibit photocatalytic properties under UV or visible light irradiation due to their nature and structure properties [3].

Three new cadmium(II) coordination polymers $[Cd_3L(CH_3COO)_4]\cdot H_2O$ (CP-1), $[Cd_5L_2(CH_3COO)_6]$ (CP-2) and $[Cd_2L(NO_3)_2]\cdot CHCl_3$ (CP-3), where H_2L stands for N,N'-bis[(2-hydroxybenzilideneamino)-propyl]-piperazine were synthetized by direct metal-ligand reaction of the respective ligand with the corresponding cadmium(II) salts. The nature of the compounds was established based on elemental analysis, and structural information were obtained by IR and UV–Vis spectroscopy and single-crystal X-ray diffraction.

The photocatalytic activity of the CPs 1 - 3 was investigated on the degradation of two anionic: Congo Red (CR), and Methyl Orange (MO). Photocatalytic studies were carried out, at room temperature, in a visible chamber with 500 W Hg lamp providing 546 nm irradiation, and the dye concentrations were determined by a UV/VIS spectrophotometry.

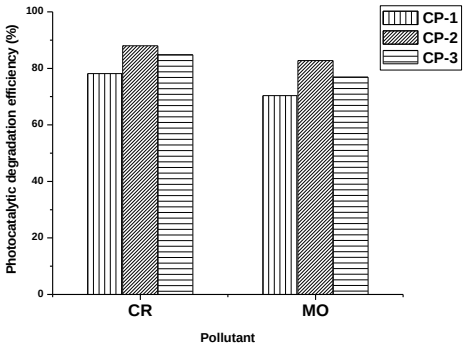

Figure 1. Photodegradation efficiency of CPs for colored pollutants, under visible irradiation (50 mg/L dye, 1 g/L CP, 25oC, solution pH)

For all investigated dyes the photocatalytic degradation efficiency increased in order: CP-1< CP-2< CP-3. The CPs were capable of photodegradation of anionic dyes, as evidenced by their decomposition efficiency up to: 88% for CR and 83% for MO.

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References

[1] M. Li, X. Wang, C.J. Porter, W. Cheng, X. Zhang, L. Wang, M. Elimelech, Environ. Sci. Technol. 53 (2019) 3078.
[2] A. Kumar, G. Pandey, Mater. Sci. Eng. C 1 (2017) 18.
[3] Gaur, R. Inorg. Chem. Front. 6 (2019) 278.