



Zinc oxide immobilized on alginate beads as catalyst for photocatalytic degradation of textile dyes – an evaluation of matrix effects

Caroline Gonçalves^a, Klaiani Bez Fontana^a, Marcos A.R. Tenorio^a,
Vera Lucia A.F. Bascuñan^a, Giane G. Lenzi^{b,*}, Eduardo S. Chaves^a

^aDepartment of Chemistry, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil, emails: carol-goncalves@live.com (C. Gonçalves), klaiani@yahoo.com.br (K. Bez Fontana), marcos.art.engquim@gmail.com (M.A.R. Tenorio), vera.bascunan@ufsc.br (V.L.A.F. Bascuñan), eduardo.chaves@ufsc.br (E.S. Chaves)

^bDepartment of Chemical Engineering, Federal University of Technology - Paraná, Ponta Grossa, Paraná, Brazil, email: gianeg@utfpr.edu.br (G.G. Lenzi)

Received 21 March 2020; Accepted 10 September 2020

ABSTRACT

Heterogeneous photocatalysis is an attractive and efficient alternative for degradation of organic pollutants in water and wastewater. Thus, we studied photocatalytic degradation of the textile dye Orange Solimax TGL 182% (OS-TGL), using the semiconductor ZnO immobilized in alginate beads as a catalyst. The catalyst was characterized by Fourier transform infrared spectroscopy and scanning electron microscopy (MEV). The optimized photocatalytic parameters were catalyst concentration, pH, textile dye concentration, and ionic strength. Additionally, we evaluated the effect of different matrices and the presence of other textile dyes in the OS-TGL removal. The OS-TGL degradation kinetics followed a pseudo-first-order kinetic model for heterogeneous photocatalysis and photolysis processes. At optimized conditions, the heterogeneous photocatalysis promoted percentages of the OS-TGL degradation higher than 99% in 60 min of reaction time. Moreover, the proposed photocatalytic process using ZnO immobilized in alginate beads allowed recycling of the catalyst up to four times without significant loss of photocatalytic degradation efficiency.

Keywords: Textile dye; Photocatalysis; Zinc oxide; Catalyst immobilization

* Corresponding author.