Photocatalyst with magnetic properties applied in the degradation of pesticides.

Henrique A. J. L. Mourão[1,2] (PG), Cezar Carvalho de Arruda [3] , Caue Ribeiro[1]

[1]Embrapa Instrumentação Agropecuária. Rua XV de Novembro, 1452, São Carlos, SP.

[2]Departamento de Química, Universidade Federal de São Carlos. Rod. Washington Luiz km 235, São Carlos – SP.

[3]Departamento de Física, Universidade Federal de São Carlos. Rod. Washington Luiz km 235, São Carlos – SP.

Efficient management of water is an object of concern for sustainable economic development. Thus, the decontamination of water becomes important, and the processes in the range of UV light - Vis on the surface of semiconductors are reported as the most potential for comerciallization[1]. Nanosized particles collaborate with high surface areas, however, lead to high costs of separation of the catalyst. A form of separate the nanoparticles is their association with magnetically activite phases - such as Fe_3O_4 (magnetite)[2]. In this context, this work describes the synthesis of core-shell nanocomposites (TiO_2 – coated ferrite) by the polymeric precursors method [3], with potential for using as catalyst in water decontamination. The Fe_3O_4 nanoparticles were prepared by the dissolution of salts ($FeSO_4$ and $Fe_2(SO_4)_3$, Synth) in an aqueous solution of citric acid (JT Baker) to 40°C, in molar proportion citric acid: metal equal to 3:1. After dissolution, the mixture was polymerized by the addition of ethylene glycol (Synth), with molar ratio citric acid: ethylene glycol equal to 1:2. The solutions were treated at 450°C for 2 hours. The synthesis of nanoparticles of $CoFe_2O_4$ followed the same procedure, using salt as the precursor Co^{2+} acetate cobalt (Co $(CH_3COO)_2$, Merck). Because of the greater stability of $CoFe_2O_4$ those nanoparticles where coated with TiO_2 using the ($Ti[OCH(CH_3)_2]_4$, Aldrich) as a precursor of the Ti, in mass ratios of 55,6:44,4; 38,5:61,5; 27,3:72,7 and 11,1:88,9 $CoFe_2O_4$:TiO_2. The suspensions were treated to 450°C for 2 hours. The figure 2 shows the change in relative concentration of atrazine over time, degradation catalyzed by nanocomposites, compared to pure TiO_2.

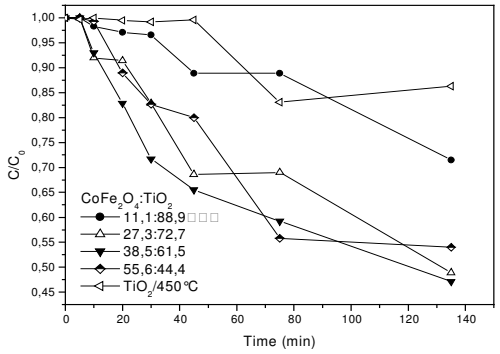

Figure 1: Profile of degradation of atrazine in UV.

The findings showed that the polymeric precursors method is feasible for the production of nanoparticles $CoFe_2O_4$@ TiO_2, with potential for use to degradation of pesticides, through the preliminary assessment of the photolysis of pesticide atrazine.

Keywords: Photocatalysis, titanium dioxide, magnetic oxide, pesticides.

e-mail: mourão@cnpdia.embrapa.br

[1]CHIRON, S.; FERNANDEZ-ALBA, A.; RODRIGUEZ, A.; GARCIA-CALVO, E. Water Research, v. 34, n. 2, p. 366–377, fev. 2000.

[2]VAYSSIERES, L.; CHANEAC, C.; TRONC, E.; JOLIVET, J. P. Journal of Colloid and Interface Science, v. 205, p. 205–212, 1998.

[3]KAKIHANA, M.; YOSHIMURA, M. Bulletin of the Chemical Society of Japan, v. 72, p. 1427–1443, 1999.