PHOTOCATALYTIC DEGRADATION OF MESOTRIONE IN THE PRESENCE OF TiO_2 HOMBIKAT MODIFIED WITH DIFFERENT Au NANOPARTICLES

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Abstract

Due to the harmful and toxic effects of organic pollutants scientists are searching for an effective method to remove these substances from the environment. One of the most efficient and environmentally friendly technologies for removing of organic water pollutants is photocatalytic degradation in the presence of various photocatalysts [1]. There are many metal-oxide photocatalysts which showed great photoactivity, but the most frequently used is TiO_2 [2]. Recently, great attention has been paid to Au nanoparticles because in the case of TiO_2 have showed extend of the spectral response to the visible light region in comparison with nonmodified TiO_2 [3], and efficiently suppress the e^-–h^+ recombination [4]. Mesotrione [2-(4-methylsulfonyl-2-nitrobenzoyl)-1,3-cyclohexanedione] is a selective herbicide for pre- and post-emergence control of broad-leaf and grassy weeds in corn. It was developed by the company Syngeta Crop Protection and it was registered in Europe in 2000, and in the United States in 2001. Beside good properties in control of weeds mesotrione has harmful and toxic effects on non-target organisms. Low sorption of mentioned herbicide may indicate the leaching potential in the groundwater from maize production fields [5], wherein its presence in environmental waters can lead to negative consequences on the aquatic ecosystem. In this paper, photocatalytic degradation of mesotrione using TiO_2 Hombikat modified with Au nanoparticles (nonmodified and modified with 2-mercaptoethanol, as well as with 2-mercaptoethanol and fullerenol nanoparticles) under simulated solar irradiation was investigated. Different volumes of various nanoparticles were added in suspension in order to enhance activity of commercial TiO_2 Hombikat under simulated sunlight.

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