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PII: S1350-4177(16)30336-4
DOI: http://dx.doi.org/10.1016/j.ultsonch.2016.09.024
Reference: ULTSON 3381

To appear in: *Ultrasonics Sonochemistry*

Received Date: 19 August 2016
Revised Date: 27 September 2016
Accepted Date: 27 September 2016

Please cite this article as: Y.M. Hunge, M.A. Mahadik, A.V. Moholkar, C.H. Bhosale, Photoelectrocatalytic degradation of oxalic acid using WO_3 and stratified WO_3/TiO_2 photocatalysts under sunlight illumination, *Ultrasonics Sonochemistry* (2016), doi: http://dx.doi.org/10.1016/j.ultsonch.2016.09.024

Photoelectrocatalytic degradation of oxalic acid using WO_3 and stratified WO_3/TiO_2 photocatalysts under sunlight illumination

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Abstract

The WO_3 and stratified WO_3/TiO_2 thin films are successfully prepared by the spray pyrolysis method. The structural, morphological, compositional and photoelectrocatalytic properties of WO_3 and stratified WO_3/TiO_2 thin films are studied. XRD analysis confirms that films are polycrystalline with monoclinic and tetragonal crystal structures for WO_3 and TiO_2 respectively. The SEM images clearly show 3D sheeted porous structure of the as–prepared TiO_2 forms on WO_3 in stratified WO_3/TiO_2 samples. The synthesized photoelectrodes was used as catalyst for photoelectrocatalytic degradation of oxalic acid in aqueous medium. The rate constant (k) was evaluated as a function of the initial concentration of species. A significant decrease in concentrations of organic species was observed from COD analysis. The photoelectrocatalytic degradation effect is relatively higher in the case of the stratified WO_3/TiO_2 than WO_3 thin film photoelectrode in the degradation of oxalic acid and 83 % removal efficiency of oxalic acid is obtained after 180 min. Based on the obtained experimental data, the possible photoelectrocatalytic reaction mechanism was proposed. The photoelectrocatalytic experimental results indicate that stratified WO_3/TiO_2 photoelectrode is the promising material for removing of water pollutants.

Keywords: Stratified WO_3/TiO_2 thin film, Oxalic acid (OA), Chemical oxygen demand (COD)

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