Chemosphere

Volume 203, Issue 15, 2018, Pages 1-10

Photocatalytically-assisted electrooxidation of herbicide fenuron usinga new bifunctional electrode PbO2/SnO2-Sb2O3/Ti//Ti/TiO2

Karima Barbari, Rachid Delimi, Zahia Benredjem, Samia Saaidia, Abdelhak Djemel, Toufik CHOUCHANE, Nihal Oturan, Mehmet A. Oturan

Abstract: The degradation of the herbicide fenuron was investigated using a new porous bifunctional electrodewhere the electrooxidation takes place on one side and the photocatalysis on the other side. The characterizationof the synthetized bifunctional electrode (PbO2/SnO2-Sb2O3/Ti//Ti/TiO2) was performed byscanning electron microscopy, energy dispersive X-ray spectrometry and X-ray diffraction analysis andshowed that the anodic side (Ti/SnO2-Sb2O3/PbO2) is covered with a tetragonal b-PbO2 film and that thephotocatalytic side (Ti/TiO2) consists of an anatase phase of TiO2. The single application of electrooxidationachieved 87.8% fenuron degradation and 84.1% chemical oxygen demand (COD) removal whileheterogeneous photocatalysis resulted in only 59.2% and 39.7% fenuron concentration decay and CODremoval, respectively. On the other hand, the photocatalytically-assisted electrooxidation (photo-electrooxidation)performed on the bifunctional electrode provided higher performances of fenurondegradation (97.5%) and mineralization (97.4%). Investigation of operating parameters highlighted thepositive effect of increase in current density. Conversely, an increase in fenuron concentration led to adecrease in degradation rate and COD removal. It was also found that the COD removal and mineralizationefficiency are higher in a neutral medium.

Keywords : Fenuron Bifunctional electrode Lead dioxide anode Electrooxidation Photo-electrooxidation