

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

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

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

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