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Water treatment containing organic compounds by coupling adsorption and electrochemical degradation at BDD anode: Sawdust adsorption performance for the treatment of dilute phenol solutions

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Phenolic compounds are present in wastewater of many industrial sectors. Aromatic compounds, in particular those having a quinonic structure, are highly toxic. Electrochemical methods seem to be promising, in particular when using the boron doped diamond (BDD) anode. Although direct electro-oxidation possesses many advantages, its efficiency is limited for the treatment of dilute solutions because of mass-transfer limitations. To overcome these limitations, an alternative approach that has been suggested here is the coupling of electrochemistry with a pre-concentration step to render it more amenable to electrochemical treatment; an efficient method for the pre-concentration of pollutants is adsorption. In the present work, the treatment of phenol solution by coupling adsorption onto adsorbents and electrochemical oxidation on BDD anode has been studied. The adsorbents chosen were a commercial activated carbon with a high specific area and sawdust made from industrial waste. The maximum adsorption capacity of the activated carbon is greater than the one obtained with sawdust. However, the regeneration efficiency after 1 cycle of adsorption and regeneration is only 59% for activated carbon. Indeed, the electropolymerization of the strongly adsorbed phenol has occurred. This phenomenon can explain the deterioration in performance of activated carbon by the obstruction of its pores during the electrolysis. By contrast, there was an increase in the adsorption capacity of the sawdust (the regeneration efficiency is more than 100%). This study demonstrated that sawdust is a promising adsorbent for the treatment of dilute solution containing phenolic compounds by adsorption onto sawdust-electrochemical degradation coupling.

Biography

Ines Bouaziz has completed her PhD in 2014. She prepared her PhD under the supervision of the University Paul Sabatier of Toulouse (Pr. K. Groenen Serrano) and the National Engineering School at the Sfax University in Tunisia (Pr. R. Abdelhedi). The aim of her works was to study the coupling of adsorption and electrochemistry for the treatment of organic pollutants discharged in waste waters. She showed that sawdust used as adsorbent can be totally regenerated under polarization contrary to activated carbon. Her results were presented in three communications in international meeting and two publications in international journals.

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