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Enhanced Degradation of Dyes present in Textile Effluent by Ultrasound Assisted Electrochemical Reactor

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Abstract

Textile industry being the backbone of any country plays a very essential part in the development of the country. The treatment of chemical dyes present in textile wastewater and its reuse for irrigational purposes has become a major concern for the researchers. The present study emphasis on proper degradation of commonly used reactive blue (RB) 19 dye present in textile effluents using ultrasound assisted electrochemical reactor technique and presenting the analysis of microparticles present in dyes and its quantitative composition before and after treatment by means of scanning electron microscopy (SEM) images at high magnification. The investigation was carried out using various parameters such as Concentration, pH and reaction rate. The testing setup also includes UV absorbance spectrophotometer, ultrasonic bath, DC power supply, weighing balance, suction apparatus, and thermometer. Our studies show that the Optimum dye degradation (i.e. 82.3 %) was achieved at time 120 minutes with pH of 3.22 for 50 ppm of solution and the maximum degradation (i.e. 85%) was achieved at 40 ^{0}C using acid (HCl) and Base (NaOH) in equal amounts after 120 minutes for solution of 30ppm. The work efficiency includes saving time, money and degrading the dyes from wastewater before toxic sludge formation.

Keywords: Dye Degradation; Ultrasonic Assistance; Electrochemical Process; Reactive Blue (RB) 19 Dye; Textile Effluent.

1. Introduction

The rapid Industrialization has polluted our Environment by releasing the toxic wastes and effluents. Because of dyeing activities, a very large amount of harmful industrial waste is being released by textile industries [1]. On a global scale discharge of 280,000 tons per year of textile effluents are estimated to be released significantly polluting the groundwater [2]. More than 50 million cubic meters of groundwater is being used by textiles and clothing industries in Tunisia, most of which are not renewable [3]. In this regard, many scientists and scholars are seeking measures to reduce the amount of water used in the dying process [4] and usage of eco-friendly dyeing materials [5]. Drinking water crisis due to environmental pollutions is a critical problem in any dry climate region. Textile dyeing operates using various classes of chemical dye and additional chemicals depending on the textile are used, which results in mixed wastewater [6] and their sludge is comprised of residual dyes such as auxiliary chemicals, surfactants, chlorinated compounds and salts [7]. Generally, textile dyes show a huge resistance to degradation, resulting in their removal from textile wastewater

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