

Zinc Oxide loaded activated carbon (ZnO/AC-olive) for degradation of Congo red dye

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Abstract:

The presence of hazardous effluents in waste water poses threat to the aquatic ecosystem and the human life. The usage of organics in several fields, such as agriculture, textile, plastic, paper industries, etc. leads to the release of these toxic and hazardous waste into the aquatic stream and causes pollution problems. Heterogeneous photocatalysis has emerged advances over the past decades due to its significant applications towards environmental remediation. In this regard, this work aims to develop a simple and low cost material as a support for the degradation of Congo red dye in aqueous media. ZnO catalyst loaded porous activated carbon prepared from Algerian olive-waste cakes (ZnO/AC-olive) was characterized using powder X-ray diffraction (XRD), BET surface area measurements, Raman microscopy, Thermogravimetry Analysis (TGA), UV-Visible Diffuse Reflectance Spectroscopy (DRS) and zeta potential measurements. The degradation efficiency was evaluated by the degradation of Congo red dye in aqueous solution, and the degraded products were identified using electrospray ionization-mass spectrometry (ESI-MS) studies. Additional experiments were carried out under N₂ flow (absence of oxygen) and with isopropyl alcohol (IPA) to examine the roles of O₂^{•-}, and [•]OH radicals, respectively. In addition, terephthalic acid (TPA) was used as a chemical trap for the [•]OH radicals to detect the amount of [•]OH formed on irradiated (ZnO-AC-olive). Our studies revealed that formation of [•]OH radicals seems to be the key for better degradation efficiency of the catalyst.

Key Words: Activated Carbon; olive-waste cakes; ZnO; Congo red; [•]OH radicals.