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PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
Constantine 1 University – Frères Mentouri
Faculty of Exact Sciences



ANNONCE DE SOUTENANCE DE THESE

Madame **HAMLAOU Mouna** Epouse **LIFA**

Soutiendra sa thèse de Doctorat en Sciences en Chimie
Spécialité : « Chimie Analytique et Physique ».

Intitulée : «Etude de la dégradation par photolyse directe
et induite de polluants organiques en milieu homogène»

D a t e : le Jeudi 14 novembre 2024 à 16 H00.

L i e u : A la salle de conférences sise au Campus Chaab Erssas - Université Constantine 1 Frères Mentouri.

Devant le jury :

Président	Nom et prénoms	Grade	Etablissement d'appartenance
	BOULKAMH Abdelaziz	Professeur	Université Constantine 1 Frères Mentouri
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Abstract:

This work aimed to investigate the photodegradation of three textile dyes: Direct Red 80 (DR80), Reactive Orange 4 (RO4), and Reactive Red 184 (RR184). The first area of investigation was dye transformation under direct excitation ($\lambda = 254$ nm). This is largely dependent on the concentration of the dye: kinetics remains sluggish at high doses (> 0.05 mM), but considerable degradation rates are induced at low concentrations (< 0.05 mM). A second time, we were interested in dye transformations brought about by acetone, hydrogen peroxide, and persulfate (PS) excitation at a wavelength of $\lambda = 254$ nm. The thermal activation of the latter was also examined. Significantly faster dye degradation occurs through UV/H₂O₂ and UV/acetone reactions, which becomes more significant as the initial doses of H₂O₂ and acetone increase. The reactivity sequence was always RO4 > DR80 > RR184, and the acetone/UV system was more effective than the UV/H₂O₂ system.

According to tests for radical identification, more than 80 % of the UV/H₂O₂ and UV/acetone reactions involved •OH and •CH₃ radicals, respectively. In order to understand dye degradation caused by •OH radicals, thermodynamic calculations based on density functional theory (DFT) validated the reactivity order found and, consequently, the critical role of the chemical structure.

In less than 30 minutes, total dye removal was accomplished by photoactivating persulfate (UV/PS). In contrast to the initial concentration of substrates, this efficiency fell with the initial PS dose. There is also fast discolouration kinetics associated with thermal activation of PS (PS/heat), particularly above 50°C. These reactions are endothermic and not spontaneous. Furthermore, it is possible to classify dyes according to their ability to undergo a transformation induced by SO₄•⁻ radicals, which is the same as that obtained with the other two processes: RO4 > DR80 > RR184.

A comparative analysis of the degradation of the chosen dyes using all the investigated processes revealed that the UV/H₂O₂ and UV/acetone processes required significantly larger reagent (H₂O₂) and acetone dosages than the two processes that relied on PS activation.

The acquired performances are arranged as follows: UV/PS > PS/Heat >> UV/acétone > UV/H₂O₂ >> UV.