Abstract

Photocatalytic Degradation of Direct Orange Dye under Solar Light †

Madalina Elena David 1,2,*, Rodica-Mariana Ion 1,2, Lorena Iancu 1,2, Ramona Marina Grigorescu 1, Ramona Elena Andrei 1, George Ionut Radu 1, Mircea Ioan Filipescu 1, Alexandrina Nuta 1 and Ana-Alexandra Sorescu 1

1 National Institute for Research & Development in Chemistry and Petrochemistry – ICECHIM Bucharest, 202 Spl. Independentei, 060021 Bucharest, Romania; rodica_ion2000@yahoo.co.uk (R.-M.I.); lorenna777ros@yahoo.com (L.I.); rmgrigorescu@gmail.com (R.M.G.); andreiramona@hotmail.com (R.E.A.); radugeorgeionut@yahoo.com (G.I.R.); mfilipecsi3@gmail.com (M.I.F.); alexnuta1256@yahoo.com (A.N.); anaalexandrasorescu@yahoo.com (A.-A.S.)

2 Valahia University, Doctoral School of Materials Engineering, 13th Aleea Sinaia, 130004 Targoviste, Romania

* Correspondence: madalina.david@icechim.ro

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As the development of the textile industry has progressed, intense concerns have been focused on the contamination of the environment caused by dye pollutants, which can cause severe environmental pollution and health problems due to their variety, toxicity, and persistence characteristics. Therefore, in recent years, the degradation of dyes in industrial wastewaters has generated considerable attention due to the huge volume of production, slow biodegradation, low discoloration, and high toxicity [1]. This study was undertaken to determine the feasibility of oxidation processes in the treatment of textile dyes. Direct Orange 26 (DO-26) is an azo dye with potential ecotoxicity to exposed organisms [2]. Effective degradation of the DO-26 was studied by photocatalytic degradation under direct solar light.

The photocatalysts used in the study were TiO₂, ferrite nanoparticles-CoFe₂O₄ and Fenton reagent. After the solutions were prepared, they were exposed to sunlight, between 2 h and 11 h in a Pyrex reactor of a cylindrical shape. Then, their maximum absorption at 495 nm and 519 nm (λₘₚₓ) was recorded at specific times by a UV–Vis spectrophotometer.

Exposure of DO-26 under direct solar light in the presence of the catalysts caused important discoloration of the dye solution in a reasonably time. Conversely, the exposure of the DO-26 to solar light without catalysts did not cause any noticeable discoloration. It can be observed that in the first 2 h, the absorbance of all DO-26 containing photocatalysts significantly decreased (Figure 1). For DO-26+50%CoFe₂O₄+50%TiO₂+Fenton and DO-26+TiO₂+Fenton, a tendency of decrease in absorbance after 11 h could still be observed.
This work demonstrates that these new materials are effective catalysts for the destruction of the industrial dye Direct Orange 26 (DO-26) under solar irradiation.

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**References**