



**“Gheorghe Asachi” Technical University of Iasi, Romania**



---

## **MODELING OF DYE REDUCTION BY SLUDGE DIGESTION: COMBINED EFFECT OF BIOCHEMICAL AND CHEMICAL REDUCTION**

**Umay Gokce Ozkan-Yucel<sup>1\*</sup>, Celal Ferdi Gokcay<sup>2</sup>**

<sup>1</sup>*General Directorate of EU and Foreign Relations, Ministry of Food, Agriculture and Livestock,  
Eskisehiryolu 9. km, Lodumlu, Ankara, Turkey*

<sup>2</sup>*Department of Environmental Engineering, Middle East Technical University, 06531, Ankara, Turkey*

---

### **Abstract**

The kinetics of azo dye reduction based on combined effect of biochemical reduction by anaerobic mixed culture and chemical reduction with hydrogen sulfide was investigated. Hydrogen sulfide was produced by sulphate reducing bacteria existing in the anaerobic mixed culture. The effect of initial anaerobic biomass, initial substrate, and initial dye (Reactive Orange 107) concentrations on reduction kinetics were studied with batch assays. The municipal waste sludge was used as electron donating substrate for biochemical reduction. The microbial biomass and substrate concentration did not affect the dye reduction rates significantly. The reduction kinetics was suggested as combination of biochemical reduction by Monod kinetics and chemical reduction by first order decay kinetics. The proposed kinetic model was validated by batch experiments for initial dye concentrations of 100, 200, 400, 800, 1600 and 3200 mg/L. The model was verified by continuous reactor study at initial dye concentration of 200 mg/L.

*Key words:* anaerobic, dye, modeling, sludge, sulfate reduction

*Received: December, 2012; Revised final: November, 2013; Accepted: December, 2013*

---

---

\* Author to whom all correspondence should be addressed: e-mail: [umayyucel@gmail.com](mailto:umayyucel@gmail.com); Phone: +903122873360-3051; Fax: +903122879468