



A novel eco-friendly advanced enzymatic Fenton oxidation process for the treatment of ship wastewater

Nagihan Ersoy Korkmaz^a, Abdullah Aksu^a, Omer S. Taskin^a, Ertugrul Aslan^b, Nuray Balkis^{a,*}

^aDepartment of Chemical Oceanography, Institute of Marine Science and Management, Istanbul University, Vefa 34134, Istanbul, Turkey, emails: nbal@istanbul.edu.tr (N. Balkis), nagihan.ersoy@istanbul.edu.tr (N.E. Korkmaz), aaksu@istanbul.edu.tr (A. Aksu), omert@istanbul.edu.tr (O.S. Taskin)

^bEnvironment Institute, Marmara Research Center-TUBITAK, Gebze, Kocaeli, Turkey, email: ertugrul.aslan@tubitak.gov.tr

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ABSTRACT

The chemical treatment of ship wastewater with high organic content was investigated by an advanced Fenton oxidation process with the addition of a laccase enzyme. In addition, this process was aimed both to reduce the amount of chemicals used in the Fenton process and to minimise the amount of organic matter in the sludge. Ship wastewater was obtained from the Haydarpaşa (Kadıköy/Istanbul/Turkey) waste management facility. This wastewater was treated in the range of pH 3–5 with classic Fenton and a new kind of Fenton method (enzymatic Fenton), and then the treatment results were compared. At a constant mixture speed and temperature, chemical oxygen demand, turbidity, colour and total organic carbon (TOC) values were examined by changing the ratio of $\text{Fe}^{2+}/\text{H}_2\text{O}_2$, $\text{Fe}^{2+}/\text{laccase}$ enzyme. In this study, the best treatment efficiency was measured at pH = 5 using the new advanced enzymatic Fenton method. The best treatment efficiency was 98.5%. This higher value was achieved using 200 mg/L H_2O_2 and 200 mg/L laccase. In addition, using this new Fenton method (enzymatic Fenton), TOC concentration is quite low (0.26%) when compared with the classic Fenton method. This advanced eco-friendly method is an alternative to other treatment methods. Thus, ship wastewater containing heavily organic loads can be treated using this new advanced method. Additionally, the residue treatment of mud containing heavy organic carbon loads can also be treated using this new advanced method.

Keywords: Ship; Wastewater; Enzymatic Fenton; Treatment; Eco-friendly

* Corresponding author.