

## Effect of Ultrasound and Electrode Material on Electrochemical Treatment of Industrial Wastewater

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Received: December 06, 2011, Accepted: February 07, 2012, Available online: March 15, 2012

**Abstract:** The effect of ultrasound (US) and electrode material on electrochemical treatment of industrial wastewater was studied. Samples were taken from three industries i.e. battery, ghee and tannery. Treatment efficiency was monitored by comparing the results of electrochemical and sonoelectrochemical processes in terms of metals and chemical oxygen demand COD removal. Experiments were performed in ultrasonic bath. In sonoelectrochemical process concentration of Pb decreased from 11.5 to 0.6 ppm at 80 kHz from battery industry. Similarly about 95 % removal of Cr (III) was observed from tannery wastewater using lead cathode. Titanium anode was found best counter electrode in metals removing. High COD removal was obtained by using steel anode at 80 kHz. Use of ultrasound is very effective in removing heavy metals and organic pollutants from industrial wastewater.

**Keywords:** Ultrasound, electrodes, electrochemical treatment, wastewater.

### 1. INTRODUCTION

Battery, leather and ghee (clarified butter) manufacturing industries, are the largest foreign exchange generators in Pakistan. The extremely high level of consumption of fresh water by these industries has resulted in generation of large volume of wastewater. Battery industries discharge mostly inorganic pollutants containing heavy metals like lead. Concentration of lead varies with the industrial operations and depends upon the amount of water discharge. In Pakistan the tanning industry is concentrated in Karachi (Korangi), Kasur, Lahore, Multan and Sialkot. More than 200 hundred tanneries are located in Kasur. As a result of tanning activities about 9,000 m<sup>3</sup> of heavily polluted wastewater is discharged daily into water bodies. Their effluents are characterized by high COD, BOD and Cr<sup>+3</sup> concentrations. Tanneries utilize large quantity of water, roughly between 15 and 20 m<sup>3</sup> per tonnes

of raw skin [1]. It is also observed that tannery wastewaters have COD and SS contents approximately five times higher than municipal wastewaters and high salt concentrations similar to brackish waters. Wastewater generated from ghee industry contains mostly organic compound like fats, oil and grease.

Various physical, chemical and biological techniques are applied to treat different types of industrial effluents. Each process has its own constraints in terms of cost, feasibility, practicability, reliability, stability, environmental impact, sludge production, operational difficulty, pretreatment requirements, extent of organic matter removal and potential toxic byproducts generation. Tannery wastewater treatment by biological processes may be difficult because of the presence of a broad spectrum of biocides used in the leather industry to prevent fungal attack [2].

The use of an electrochemical process for treatment of wastewater can be considered a relatively simple and clean method. Electrochemical treatment of wastes can result in partial or complete decomposition of the pollutants. Complete mineralization of or-

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