

## DECOLORIZATION OF AZO-REACTIVE DYES AND COTTON-TEXTILE WASTEWATER USING ANAEROBIC DIGESTION AND ACETATE-CONSUMING BACTERIA

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### EXTENDED ABSTRACT

An anaerobic digestion technique was applied to azo-reactive dye aqueous solutions and cotton textile wastewater aiming at the color elimination. All experiments were carried out in a 2L batch-mode water-jacketed reactor that was slowly stirred using a magnetic stirrer. The pH was maintained in the range of 6.6-7.2 using acetic acid solution (10% v/v) and a pH-controller, while the temperature was kept constant at 37°C using an external water bath. Acetic acid also served as an external substrate (electron-donor) supply for the bacteria metabolism while, acclimatized acetate-consuming bacteria initially derived from the anaerobic digester sludge of a municipal wastewater treatment plant were used for this study. A total of six of the most representative and commonly used azo-reactive dyes from both the Levafix and Remazol types were tested. The dye-solutions were prepared as follows: 20mg/L of the dye, 1g/L sodium acetate and 10mL/L fertilizer were dissolved in tap water and brought to the desired temperature (37°C). The pH was also adjusted at the above-mentioned range and then nitrogen gas was utilized in order to purge the air out of the reactor. Finally, 100mL of the inoculum were introduced into the reactor in order to start the anaerobic digestion. Samples were withdrawn from the reactor, filtered using 0.2µm-pore filters and analyzed for color using a spectrophotometer. The yellow, red and blue colors were measured at 436, 525 and 620nm respectively. Highly reductive conditions were developed (redox = -270 to -360mV) after 1 day of experiment and almost complete decolorization of all dye solutions was succeeded in 4-5 days of experimental run. The biodegradation ability of cotton textile wastewater was also examined without the addition of external substrate supply (acetic acid) resulting to poor decolorization results (Hydrochloric acid solution was utilized instead in order to regulate the pH). The organic content of the textile wastewater proved very low to act as a sufficient substrate for the growth of anaerobic bacteria and the complete decolorization of the wastewater. However, anaerobic digestion of the same wastewater was repeated using this time the acetate-consuming bacteria and acetic acid as an external substrate supply. Due to the regular supply of acetic acid (as a substrate) a continuously active anaerobic biomass was maintained at all times. Anaerobic (reductive) conditions were developed very fast (redox = -350 mV) leading to almost complete wastewater decolorization in 4 days of experiment.

**Key words:** acetobacter, acetic acid, azo-reactive dyes, anaerobic processes, decolorization, waste-water treatment.