

# COD and color removal of a textile effluent by anaerobic granular biomass: Batch test study

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## INTRODUCTION

Depending on the type of wet processes used, the textile processing generates high amounts of effluents with varying composition (Dawood et al., 2014). The conventional activated sludge process alone is not highly effective for the color removal of the textile effluents, since most aerobic bacteria are incapable of completely degrading the dye molecules (Shaul et al., 1991). Under aerobic conditions, low dye decolorization is achieved because oxygen is a more effective electron acceptor than dyes (Stolz, 2001). On the other hand, under anaerobic conditions, a more effective dye degradation can be achieved (Field et al., 1995). Using granular or flocculent sludge, under anaerobic conditions, dyes are generally the sole terminal electron acceptor, and, because of this, a better decolorization is obtained. Cervantes (2009) reports, in its review, several applications of the anaerobic treatment for the dyes removal from textile effluents. The reduced products of the anaerobic treatment (aromatic amines) are in general anaerobically recalcitrant, which means that the complete decolorization of dyes cannot be accomplished under anaerobic conditions only. However, the bioconversion of these aromatic compounds under aerobic conditions is relatively fast (Dos Santos, 2007). Anaerobic decolorization followed by aerobic post-treatment is generally recommended for treating colored wastewater from textile and dyestuff manufacturing industries (Holkar et al., 2016). The aim of this study was to investigate, in a batch test, the efficiency of dyes and COD removal under anaerobic conditions using granular biomass. The results of this study were used to assess the possible scale-up investigation in a pilot UASB reactor and the further scale-up to full-scale applications.

## MATERIALS & METHODS

The textile effluent was obtained from an ETP in Bangladesh. The influent characteristics are reported in the table below.

Parameters	Units	Values
COD	mg/L	1687±87
sCOD	mg/L	500±12
TSS	mg/L	790±12
$\lambda$ (880 nm)	-	0.242

The experimental activity was carried out at the University of Verona in the LabiCAB laboratory. The anaerobic granular biomass, obtained from a UASB pilot-scale, was acclimated for 15 days with the textile effluent at a constant temperature of 37° C in a serum bottle of 800 mL.

After 15 days, 200 mL of acclimated biomass were inoculated in the serum bottle filled with 600 mL of fresh effluent (Sample) and 200 mL of biomass were inoculated in another bottle filled with water (Blank). The procedure was carried out threefold.



SAMPLE



BLANK

## RESULTS & DISCUSSION

Once sample and blank bottles were filled, the soluble COD (sCOD) was measured in order to evaluate the dilution factor in the sample bottle and the biomass background sCOD in the blank bottle.

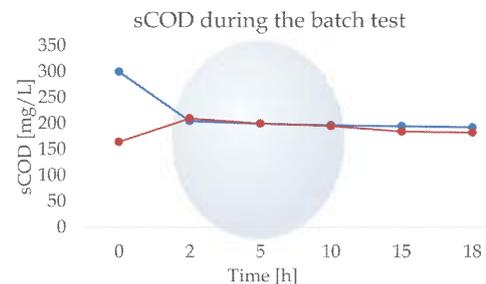
The sCOD at the beginning of the activity in the sample bottle was 300 mg/L, while in the blank bottle was 165 mg/L.

During the first 2 h of the batch test, the increasing of the sCOD in the blank indicated a series of possible hydrolysis reactions. In that period, it was possible observe that the sCOD in the sample decreased. These results could be attributed to both adsorption and biodegradation processes.

By comparing the sCOD of both the sample and the blank, no difference was found. These results indicate that if the sCOD of the sample is the same than that of the biomass background (blank), then the sCOD initially present in the sample was completely depleted.



At the end of the batch test the supernatant of the sample, after the subtraction of the blank, was taken to measure the total COD. The results of 125 mg/L show an **efficiency removal of 92%** considering the inlet textile effluent concentration of 1687 mg/L.



After 12 h, the absorbance (880 nm) of the supernatant was 0.068, showing a **color removal efficiency of 72%** considering the textile effluent absorbance of 0.242.



TEXTILE EFFLUENT



AFTER 12 h IN ANAEROBIC CONDITIONS

## LITERATURE

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## FUTURE OUTLOOK

The result obtained show high performance on COD and color removal for the textile effluent, using granular sludge in anaerobic conditions. Even though these results of the batch test were positive to investigate the performance of the anaerobic granular sludge, such study needs further investigation in a pilot scale reactor (e.g. UASB) in order to evaluate the possible full-scale implementation.

## INFORMATION

For further information about the application of **anaerobic treatment in textile ETPs**, please go to:

[www.pantareiwater.com](http://www.pantareiwater.com)