

Decolorization of the Reactive Dyed Cotton Fabrics with the Use of Ozone Assisted Eco-technology ^{*}

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Abstract

The textile coloration sector normally employs the color stripping process for correcting the various faults obtained during the wet processing operations like the printing and dyeing. However, the traditional method for the color stripping carries with it the possibility of grave ecological pollution. The purpose of this work is to investigate the new, ecological method such as ozone based process for the color stripping of the reactive dyed textiles. This novel ozonation process was performed at room temperature with low amount of chemical auxiliaries. The effects of different process parameters like the acidic pH, 45 g/m³ ozone concentration and the treatment time of 30 minutes on the color stripping was investigated. Additional colorimetric analysis has been studied. The results indicate that the color stripping was achieved effectively at the atmospheric temperature with the ozonation process. This proposed technique was successfully implemented for the color stripping of different reactive dyes on the cotton substrate.

Keywords: Cotton dyed textiles; Decolorization; Eco technology; Ozone assisted process

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1 Introduction

In textile industry, dyeing process is normally used for the coloration of the textiles which needs to be performed with high accuracy. Sometimes during this process, we may come across the off shade problem, in which the achieved shade is far different than the desired shade. To rectify this problem normally the redyeing process or the color stripping of the dyed fabrics process is carried out. Traditional way of color stripping comprises of the use of oxidizing agent or reducing agent. Another approach to achieve effective color stripping is subsequent use of the reductive and oxidative methods [1].

Stripping process is often termed as back stripping or destructive stripping. Back stripping is performed when there is change in the depth of the shade and the destructive stripping consists of the chemical alteration of the dye [2]. Color stripping using reductive method consists of the use of reducing agents like sodium hydrosulphite, thiourea dioxide along with the use of the stripping assistants. Hydrogen peroxide, sodium chlorite and sodium hypochlorite are the most common oxidizing agents used in the industry [2].

Now a days, a lot of research is going to find out ecofriendly ways for the process development in textiles. Decolorization of the reactive dyed fabrics using the enzymes has already been carried out [3]. Advanced oxidation technologies like, ozone, peroxide combined with ozone and peroxide combined with ultrasound has already been carried out for the degradation of the wastewater containing the reactive dyes [4]. Utilisation of the ozone has merits such as energy and time savings (since ozonation is carried out at room temperature) and reduction in the environmental load (by avoiding the usage of harsh conventional process consisting of the reduction clearing chemicals). Hence the ozone use leads to environmental benefits and can be a good ecotechnology for use in textile industry [1]. The decolorization of the reactive dyed textiles in a sustainable manner is an essential need. In our study, ecotechnology like ozone assisted process was investigated for the color removal process. Two reactive dyed fabrics (Rouge Everzol C-RB 133, Orange Everzol FC reactive dyes) were used for the study of the color stripping. These dyestuffs were previously used for the coloration process of the pretreated cotton plain-weave fabric. Assessment of the color removed fabrics was done with the color stripping % and also with the colorimetric analysis.

2 Experimental

2.1 Materials

A 100% Ready for dyeing (RFD) cotton fabric of percale quality was used for this study. Orange Everzol FC (CI number not disclosed), Rouge Everzol C-RB 133(Reactive CI Red 198) dye (as shown in Fig. 1) supplied by the Achitex Minerva, were used for the dyeing experiments. Phosphoric acid and Caustic soda were laboratory grade for the experimental process.

2.2 Dyeing Procedure for the Cotton Fabrics

The dyeing process was carried out in a Jigger machine (Teinturerie Lenfant, France). Dyestuff of 1% of fabric weight was used with the standard recipe for the dyeing of cotton fabrics with reactive dyes (Rouge Everzol C-RB 133, Orange Everzol FC reactive dyes).