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Color stripping of the reactive dyed fabric by conventional and ozone assisted process- a comparative study

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Abstract:

The decolorization of the Reactive Black 5 azo dyed cotton textile was studied by ozone assisted process and the conventional reductive treatment. The ozonation process comprised of different parameters like pH, ozone concentration (g/m³ NTP ozone) and the treatment time. The results obtained showed that the decolorization rate was almost the same in both the process of almost around 98-99 %. However, the strength losses were less in the conventional process. Also, the ozone assisted process was performed at room temperature and with no harsh chemicals as compared to conventional strong reductive treatment which was carried out at boiling temperature with strong reducing agents. Therefore, the ozonation process seems to be a more sustainable option for the decolorization process in the textile wet processing sector.

Keywords: Reactive dyed textile, ozonation process, conventional reductive treatment, color stripping, tensile strength.

Introduction:

Textile coloration industry, often faces problems related to off shade wherein the shade obtained is different than the one desired. This problem can be solved through the decolorization of the textile (color stripping from textile) or by redyeing of the fabric. Decolorization of textiles is a traditional process performed with the use of reductive or oxidative techniques. Another approach for stripping of color from textiles is subsequent combination of the reductive and oxidative methods. Conventional Color stripping process causes some damage to the fabrics, due to the use of harsh chemicals in the stripping treatment. Also, these harsh chemicals further contribute to the ecological pollution. The examples of oxidizing agents used for color stripping are sodium hypochlorite and potassium permanganate, while the examples of reducing agents are sodium hydrosulphite and thiourea dioxide [1-3].

In this study, we used the ozone for the color stripping of the textiles in a pilot scale reactor. The results found can be a basis for the use of this technology at an industrial scale for the clothing industry.

Materials and Methods:

A cotton fabric (GSM 150) was dyed by pad batch method resembling 1 % Shade (Noir Everzol B, C.I. Reactive Black 5 dye) in France. Conventional color stripping was carried out in Mathis labomat rota dyer. Sodium hydroxide, sodium hydrosulphite and phosphoric acid were of laboratory grade and used as received. The ozonation experiments were performed in a 60 liters pilot reactor at Ozone platform (UniLasalle, France). Ozone gas is injected in the reactor by venturi system combined with the circulation pump. The dissolved ozone is a good oxidizing agent for the decolourization process.

Color stripping: Conventional method was carried out with 10 g/L sodium hydrosulphite and 10 g/L NaOH at 100 °C for 30 minutes in rota dyer while Ozonation process was performed at pH 3, Ozone concentration 90g/m³ NTP ozone and treatment time 20 minutes.

Results and discussion: The K/S colour strength has been measured with spectrophotometer from 360 to 740nm (figure 1). Taking into account the 2 Y-axis scale, a strong reduction of the color is obtain for the both methods. The color stripping correspond to this reduction at wavelength range 640nm. Mechanical properties have been studied to get information about the degradation of the textile (table 1).

Sr.No.	Treatment	Color stripping %	tensile strength loss %
1	Conventional reductive color stripping	98	5
2	Ozone assisted color stripping	99	10

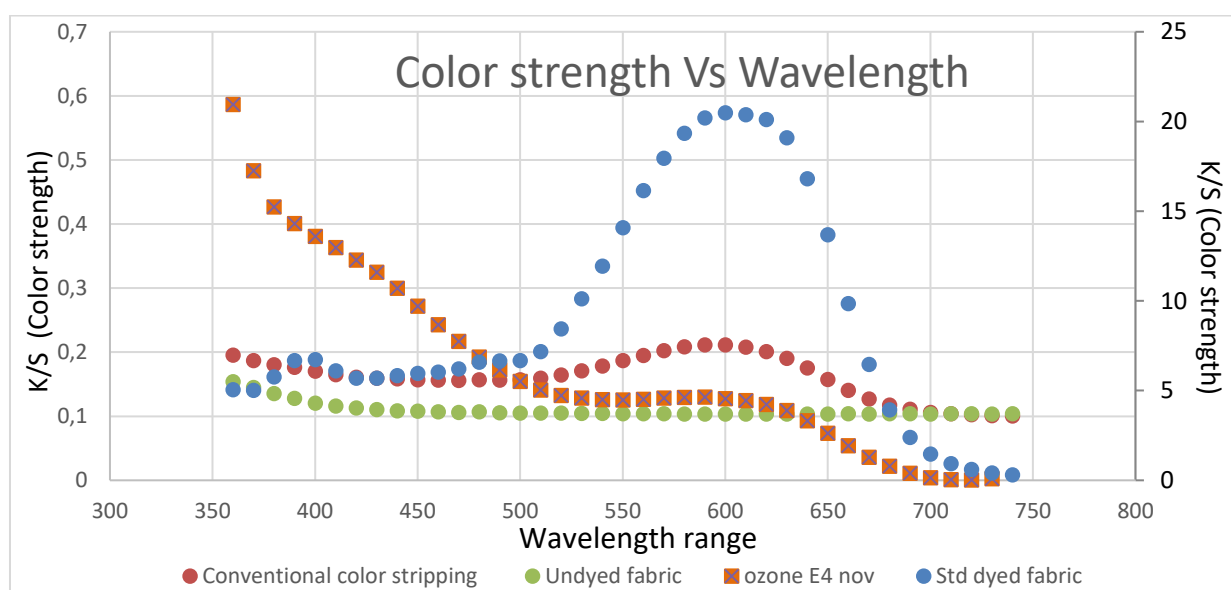


Fig.1 Color strength Versus Wavelength for the std dyed, undyed and stripped fabric (Chemically).

Conclusion:

Ozone assisted process gave good results in terms of color stripping as the conventional chemical based decolorization. Strength losses were found less in the traditional method. Ozone assisted process seemed to be greener in terms of the ecological aspects.

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