

EFFECT OF SODIUM HYDROXIDE (NaOH) CONCENTRATION IN SCOURING-BLEACHING PROCESS OF KNIT FABRIC

Tanvir Ahmed Chowdhury

Department of Textile Engineering, Daffodil International University
Dhaka-1207, Bangladesh

E-mail: tahmed@daffodilvarsity.edu.bd

Abstract: This study makes an assessment on the effect of NaOH in scouring-bleaching process of knit fabric. To conduct this research work we have taken fifteen samples of three different structure knit. At first the samples were scoured & bleached with appropriate five recipes having same value of all parameters except NaOH. Then the samples were neutralized with the help of a suitable recipe. Next Weight loss%, Immersion test & wicking test were performed to evaluate scouring-bleaching process. Finally the results of the evaluation tests were critically analyzed.

Keywords: Scouring, Bleaching, Knit fabric, NaOH concentration.

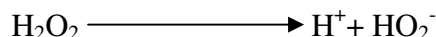
1. Introduction

Scouring-Bleaching is the process of removing impurities and color from the grey textile material as efficiently as possible, with minimum or no damage to the fiber and leaving in a perfect white state [1,4,10]. The knack of scouring-bleaching has been experienced since the establishment of civilization [2,6,8]. When the cotton is treated at boiling temperature with alkali, a lot of changes is occurred, such as-Saponifiable oils and free fatty acids are converted into soap, proteins are degraded to simple soluble amino acids or to ammonia, amino compounds are dissolved, pectose and pectins are converted into soluble salts of pectic acid, adventitious dirt is removed and retained in suspension by the soap, dressings and sizing materials break down into soluble products and unsaponifiable oils are emulsified by the soaps during the hydrolysis of the saponifiable matter [5,7].

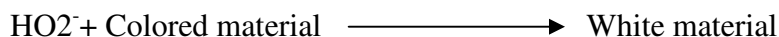
H₂O₂ is a universal bleaching agent and both protein and cellulosic fibres can be bleached by H₂O₂. In this study H₂O₂ has been used as bleaching agent because of its easy use and this type of bleaching can be done alongside scouring process. Scouring-Bleaching in combined stage has some benefits also. In peroxide bleaching, Hydrogen peroxide is used as bleaching agent. This type of bleaching of cellulosic fibres is carried out in alkaline liquor near boil.

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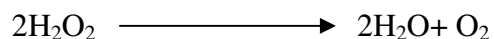
H_2O_2 was first invented by Thenard in 1888. Under certain conditions, particularly with regard to pH, H_2O_2 will liberate in hydrogen and perhydroxyl ion [3, 10].



Maximum bleaching activities from H_2O_2 is obtained generally at about pH=11.5. Produced perhydroxyl ion is responsible for bleaching action.



An opposite reaction can also occur, particularly in the presence of catalysts which may direct break down of hydrogen peroxide in water and molecular oxygen.



The liberated oxygen however has no bleaching action and the catalysts are therefore the cause of loss of bleaching agent during bleaching process.

2. Research Methodology

2.1. Sample collection

Single Jersey, Rib & Interlock are very common and mostly used knit fabric not only in our country but also all over the world. To conduct this research work, 15 samples of mentioned three structures were taken. The GSM of the samples are given below:

Table-1: Fabric type with GSM

Fabric Type	GSM
Single Jersey	120
Rib	200
Interlock	200

2.2. Recipe

At first the samples were scoured & bleached with suitable five recipes. Each recipe has different amount of NaOH but other parameters remain same. Then the samples were neutralized with the help of an appropriate recipe.

Recipe for Scouring-Bleaching:

Wetting Agent.....	1 gm/L
Sequestering Agent.....	0.75 gm/L
Detergent.....	1 gm/L
NaOH.....	3 gm/L
H_2O_2	6 gm/L
Stabilizer.....	1 gm/L

M:L..... 1:40
 Temperature..... 98°c
 Time..... 30 min
 Sample Weight..... 43.21 gm

Recipe of Neutralization (Scouring-Bleaching):

H₂O₂ killer.....8gm/l
 Acetic Acid.....1gm/l
 Temperature.....50°c
 Time.....30 min

2.3. Evaluation of Scouring-Bleaching

Weight loss%, Immersion test & wicking test were done among the four processes of evaluation. In case of weight loss test, the weight of unscoured and scoured sample is taken at same MR% and from these figures weight loss% can be calculated from the following formula:

Weight loss = {(Wt. of unscoured sample - Wt. of scoured sample)/ Wt. of unscoured sample}*100%. The standard weight loss is (4-8)%. If it is 8% then we may say that the sample is well scoured, but if it is more than 8% then it is not acceptable as it indicates that the fibre damage has been taken place. If it is less than 4%, it shows that the sample is not well scoured and there are some impurities still present in the sample.

A sample is more absorbent when it is scoured. 1 cm×1 cm sample is placed on a water surface and time taken by it to be immersed is noted. The standard time is 5 second. It is up to 10 second. If it is greater than 10 second then it indicates that the scouring has not taken place properly.

In case of wicking test, a sample of 5 cm x 18 cm is taken and a mark is made at 1 cm from bottom. Then 1cm portion is immersed into 1% direct dye solution for 5 minutes and then the distance traveled by the colored solution above 1cm mark is noted. The acceptable range is (30-50) mm.

3. Data Analysis & Discussion

In case of Single Jersey fabric the result of the evaluation tests can be shown as below table:

Table-1: Evaluation test result of scouring-bleaching for Single Jersey fabric

NaOH Concentration	pH	Weight Loss%	Immersion Test	Wicking Test
3 gm/L	11.15	5.32%	6.10 sec	40 mm
3.25 gm/L	11.36	5.43%	6.15 sec	41 mm
3.5 gm/L	11.54	5.51%	5.89 sec	43 mm
3.75 gm/L	11.81	5.86%	5.75 sec	44 mm
4 gm/L	12.04	6.15%	5.43 sec	45 mm

In case of Rib fabric the result of the evaluation tests can be expressed by the following table:

Table-2: Evaluation test result of scouring-bleaching for Rib fabric

NaOH Concentration	pH	Weight Loss%	Immersion Test	Wicking Test
3 gm/L	11.15	4.19%	7.50 sec	35 mm
3.25 gm/L	11.36	4.49%	7.47 sec	36 mm
3.5 gm/L	11.54	4.65%	7.23 sec	41 mm
3.75 gm/L	11.81	5.01%	7.00 sec	42 mm
4 gm/L	12.04	5.25%	6.43 sec	44 mm

In case of Interlock fabric the result of the evaluation tests can be revealed by the following table:

Table-3: Evaluation test result of scouring-bleaching for Rib fabric

NaOH Concentration	pH	Weight Loss%	Immersion Test	Wicking Test
3 gm/L	11.15	4.15%	7.27 sec	35 mm
3.25 gm/L	11.36	4.25%	7.05 sec	37 mm
3.5 gm/L	11.54	4.42%	6.98 sec	38 mm
3.75 gm/L	11.81	5.61%	6.79 sec	39 mm
4 gm/L	12.04	5.24%	6.74 sec	40 mm

On the basis of the mentioned tables, it has been clear that there is a relation between concentration of NaOH & scouring-bleaching process of knit fabric. If the concentration of NaOH increases then the weight loss of knit fabric also increases and immersion time decreases. All types of knit fabrics such as Single Jersey, Rib and Interlock give the same result. In case of wicking test, the same thing has been occurred. The best result has been

found at pH 12.04. So it is clear that the most excellent result of scouring-bleaching can be happened at pH 12.04. To achieve this pH, around 4 gm/L NaOH is needed. As a result, It can be said that 4 gm/L NaOH is effect for scouring-bleaching process.

Furthermore, knit fabric structure of fabric GSM may have some impact on scouring-bleaching process. This study also reveals that Interlock fabric shows the higher weight loss% than Rib fabric. Again, Rib fabric gives higher weight loss% than Single Jersey Fabric. In case of immersion test and wicking test, the same result has been observed.

4. Conclusion

In this research work, the appropriate concentration of NaOH has been found out for scouring-bleaching process. It is very important to know the ideal concentration of NaOH during scouring-bleaching process in dyeing industry. Less concentration of NaOH gives poor result and more concentration is a big threat for fibre damage which reduces the strength of textile product. This study also indicates that GSM & fabric structure have effect on scouring-bleaching process of knit fabric. More compact structure gives lower result of weight loss%. In case of GSM, higher the GSM, lower weight loss%. The immersion test and wicking test give the same consequence as weight loss%.

References

- [1] AATCC Technical Manual, Vol.75, Research Triangle Park: AATCC, 2000.
- [2] AATCC Technical Manual, Vol.66, Research Triangle Park: AATCC, 1991
- [3] Athur,D. Broadbent., *Basic Principles of Textile Coloration.*, Society of Dyers & Colourists, UK, 2001, 132.
- [4] Cates, D.M; Cranor, W.H., *Textile Res. J*, 1960, 30, 848.
- [5] Conzelmann, F; Wurster, P; Zahn, A., *Textil Praxis International*, 1989, 644.
- [6] Easton, B.K., *Ciba Geigy Rev.*, 1971, 3, 3.
- [7] John, Shore., *Colorant & Auxiliaries*, Hobbs The printers., Hampshire, UK, 2002, vol.2, 602-607.
- [8] Peters, R.H., *Textile Chemistry*, Elsevier Publ., 1967, vol.2.
- [9] Rounsaville, J; Rice, R.G., *Ozone. Sci. Eng.*, 1997, 18, 549.
- [10] Shenai, V. A., *Technology of Bleaching and Mercerizing*, Sevak Publications., New Dehli, 1991, 10-60.
- [11] Schulz, G., *Textil Praxis International*, 1990, 40.