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" EFFECT OF HYDROGEN PEROXIDE CONCENTRATION ON JUTE FABRIC "

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Abstract: Maximum whiteness of jute fabric can be obtained by using minimum hydrogen peroxide in combined bath scouring and bleaching process. To ensure minimum weight loss (%) of jute fabric to obtain maximum absorbency and ensure minimum strength loss of jute fabric. To increase the efficiency of combined bath scouring and bleaching process we can save process cost. If we use more hydrogen peroxide weight loss% will be high at the same time absorbency, whiteness will also high but fabric strength, drop absorption time and immersion time will be low.

Keywords: Concentration, weight loss, whiteness, immersion, absorbency, strength.

1. Introduction

Hydrogen peroxide (H₂O₂) is the simplest peroxide (a compound with an oxygen-oxygen single bond). It is also a strong oxidizer. Hydrogen peroxide is a clear liquid, slightly more viscous than water. In dilute solution, it appears colorless. Due to its oxidizing properties, hydrogen peroxide is often used as a bleach or cleaning agent. The oxidizing capacity of hydrogen peroxide is so strong that it is considered a highly reactive oxygen species. Concentrated hydrogen peroxide, or 'high-test peroxide', is therefore used as a propellant in rocketry. [1] Hydrogen peroxide (H₂O₂) is not a flat molecule; it adopts a nonplanar (twisted) structure of C₂ symmetry. Although chiral (the twist can be left or right-handed), the molecule undergoes rapid racemization, the result of which is that the left and right-handed twist forms cannot be isolated as they can quickly "flip" their handedness. The observed anticlinal "skewed" shape is a compromise between two

conformers, called syn and anti. If the molecule had the flat shape of the anti conformer, it would minimize steric repulsions. However, if it had the 90° torsion angle of the syn conformer, there would be optimized mixing between the filled p-type orbital of the oxygen (one of the lone pairs) and the LUMO of the vicinal O-H bond. The compromise angle has the lowest energy state. [2] Louis Jacques Thénard first described hydrogen peroxide in 1818. He produced it by reacting barium peroxide with nitric acid. [3] Pure hydrogen peroxide was long believed to be unstable. This was because of failed attempts to separate the hydrogen peroxide from the water, which is present during synthesis. However, this instability was due to traces of impurities (transition metals salts) that catalyze the decomposition of the hydrogen peroxide. One hundred percent pure hydrogen peroxide was first obtained through vacuum distillation by Richard Wolffenstein in 1894 [4] For perfect coloration of a substrate, it is necessary that all the impurities be removed from the surface and remove yellowish or brownish color which may effect the tone and brightness of the shade obtained by dyeing. Hydrogen peroxide is the most important oxidative bleaching agent which has to a very great extent to replaced reductive bleaching agents. The bleaching process has been known for thousands of years [5]. To the production of pure white materials, is necessary to removal and destruction of natural and adventitious coloring matter. Jute is the cheapest textile fiber and is used in great quantities [6] Jute is difficult to bleach, since it suffers degradation when treated with chlorine,

especially in alkaline solutions. The best varieties, however, have comparatively little colour and can be dyed without bleaching. [7] So we can say perfect scouring and bleaching is very necessary for effective dyeing.

2. Materials and Methods

2.1. Fabrics: 100% Jute fabric

2.2. Collection of Dyes and Chemicals Chemicals were collected from BASF and other Chemicals Company.

2.3. Experimental Procedure Fabric was loaded on sample Jigger m/c and took necessary chemicals & auxiliaries. Jute fabric was scoured and bleached according to below mentioned recipe. Here M: L ratio was taken as standard is 1:10. After scouring and bleaching strength, P^H , weight loss %, absorption and immersion time was observed.

2.4. Causes of hydrogen peroxide using in alkaline conditions Hydrogen peroxide (H_2O_2) is one of the most common bleaching agents. The positive aspects of hydrogen peroxide include the fact that it is environmentally

friendly (decomposes to O_2 and H_2O), colorless and non-corrosive. To be effective however, hydrogen peroxide requires alkaline conditions and suitably elevated temperatures of about $50^\circ C$. Hydrogen peroxide (liquid form) can be used as such in commercial products (i.e. ACE Gentile line up for P&G) or associated with compounds such as borates or carbonates to form solid particles, providing opportunity to formulate hydrogen peroxide in granular detergents.

2.5 scouring and bleaching Recipe

Wetting Agent	1 g/l
H_2O_2	***
Sequestering Agent	1 g/l
Peroxide Stabilizer	1 g/l
Caustic Soda	4 g/l
Detergent	2 g/l
Time	50 minutes
Temperature	$100^\circ C$.
Material : Liquor	1:10

3. Results and Discussion

Table 3.1.1 Result of P^H

Recipe No	H_2O_2 amount (g/l)	P^H
Recipe-1	2 g/l	11.70
Recipe-2	4 g/l	11.62
Recipe-3	6 g/l	11.44
Recipe-4	8 g/l	11.23
Recipe-5	10 g/l	11.12
Recipe-6	12 g/l	11.04
Recipe-7	14 g/l	10.90
Recipe-8	16 g/l	10.83

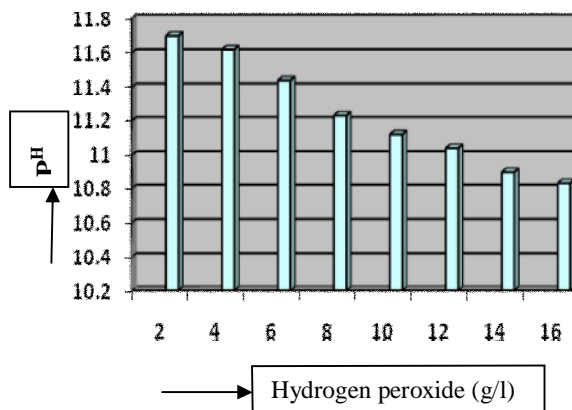


Figure 3.1.2 : Effect of Hydrogen Peroxide on P^H

3.2. Results of weight loss test

Standard range of weight loss= 4-8%

Less than 4%= Fabric is not scoured well.

Above than 8%= Fiber damage happened and oxy-cellulose formation.

Table 3.2.1 Results of weight loss test

Sample no.	Grey sample weight	Scoured & bleached sample weight	Weight loss in percentage
1	10 gm	9.39	6.1
2	10 gm	9.28	7.2
3	10 gm	9.25	7.5
4	10 gm	9.21	7.9
5	10 gm	9.20	8.0
6	10 gm	9.25	7.5
7	10 gm	9.24	7.6
8	10 gm	9.11	8.9

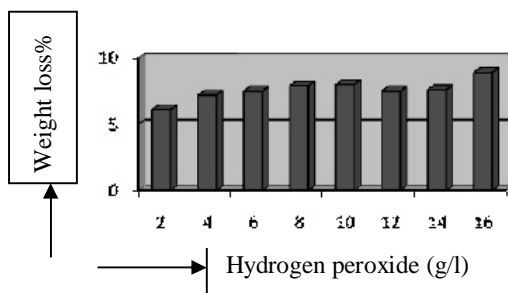


Figure 3.2.2 : Effect of Hydrogen Peroxide on Weight Loss.

3.3. Result of Drop test and Immersion Test

The standard time of immersing is 5 sec.
 The standard time for the absorption of one drop of solution is 0.5-0.8 up to 1 sec.

Table 3.3.1 Result of Drop test and immersion test.

Immersion time (second)	Drop absorption time (second)
10.20	1.83
4.95	1.07
3.58	1.03
1.06	0.88
0.82	0.62
0.70	0.57
0.65	0.55
0.56	0.53

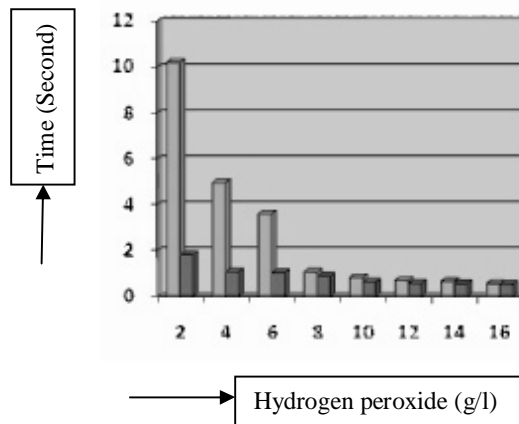


Figure 3.3.2 : Effect of Hydrogen Peroxide on drop test and immersion test.

Bleached fabric offer many advantages than unbleached fabric in dyeing & finishing. But during scouring & bleaching, H₂O₂ is most important chemical, which amount influence the scouring & bleaching effect of the knitted fabric. In this work, we first produced single jersey knitted fabric, which are not suitable for further process such as dyeing & finishing due to the presence of impurities & lack of absorbency & whiteness. To remove impurities & natural grey color, combined scouring & bleaching with H₂O₂ is done. But different amount of H₂O₂ in bleaching give different absorbency, whiteness & strength of bleached fabric. Thus, different amount H₂O₂ treated bleached fabrics is tested for their performance of whiteness, weight loss, absorbency & bursting strength.

The test results show a standard weight loss, significant absorbency, whiteness difference between grey fabric & bleached fabric. Further more the result show that the bleached fabrics are more absorbance & white than grey fabrics. If the amount of hydrogen peroxide is increased, the absorbency & whiteness also increased, but strength decreased. So, for jute fabric (5-7)gm/l H₂O₂ is appropriate amount for combined bath scouring & bleaching at 50 minutes with 100⁰c temperature in laboratory dyeing machine where M:L is 1:10. This is balancing among absorbency, whiteness & strength of bleached fabric.

4. Conclusions

The purpose of this research project is to determine the appropriate amount of the Hydrogen Peroxide for combined bath scouring & bleaching. With the increasing of more hydrogen peroxide concentration p^H of fabric will gradually less. The research activity in this project are focused on the absorbency test, whiteness test, bursting test for measure

- i. Weight loss 7.5% (std. wt. loss is 4-8%).
- ii. Immersion time 1.06 to 3.58sec. (std. time is up to 5 sec).
- iii. Drop absorption time 0.88 to 1.03 sec. (std. time up to 1 sec).
- iv. Spot test shows round shape which means good scouring & bleaching.

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