

EFFECT OF PLASMA TREATMENT ON POLYESTER/COTTON BLEND TERRY FABRIC

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ABSTRACT

It is worth noting that plasma surface treatments have the potential to offer a range of benefits for the textile industry, including improving product quality and creating environmentally friendly finishing techniques. These treatments can be used to modify the surface properties of fabrics in various ways, including cleaning, increasing micro roughness, and producing radicals to create hydrophilic surfaces. Plasma polymerization, a process for depositing polymeric materials on textile substrates, is also being explored. One advantage of plasma treatments is that they only affect the top layers of the substrate, preserving the desired bulk properties. Research has been conducted on the effects of plasma treatment on textile properties such as dyeing and color fastness in cotton terry fabric, and statistical tools have been used to analyze the results.

Keywords: Etching, K/S value analysis, Adhesion, Oxygen plasma treatment, SEM Analysis

1. INTRODUCTION

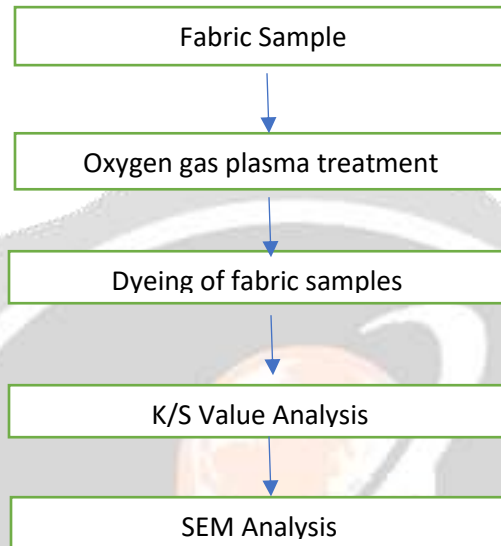
Plasma technology has been widely used in the microelectronics industry since the 1960s, and in the 1980s it began to be used for various surface treatments, particularly for metals and polymers. Plasma treatment can enhance the properties of a range of materials, including plastics, polymers and resins, paper and board, metals, ceramics and inorganics, and biomaterials, by increasing wettability, adhesion, biocompatibility, protection and anti-wear, sterilization, and chemical affinity or inertness. In recent years, there has been increased interest in using plasma technology to modify textiles and nonwovens, as it is a cost-effective way to achieve a wide range of functionalization. Plasma treatment involves using reactive species, generated through ionization, fragmentation, and excitation processes, to dissociate chemical bonds and create new recombination mechanisms. This method can be used to modify existing fibers to improve the uptake of dyes and finishes or to impart unique functionality.

2. ADVANTAGES OF PLASMA TREATMENT

- Plasma treatment is mainly utilized for enhancing the wicking properties of dry textile surfaces.
- The surface properties of textile materials are optimized without altering their inherent characteristics through plasma treatment.

- The improved performance and colourfastness properties are better in the finished textile after plasma treatment.
- The improvement of bonding, printing, coatings, and adhesion through increased wettability is a characteristic of plasma.

3. METHODOLOGY



4. MATERIALS

- Fabric: P/C (20:80) Blend Terry Fabric
- GSM: 200
- Dye: Reactive/Disperse Dye
- Gas: Oxygen and Argon

5. EXPERIMENT

5.1 PLASMA TREATMENT

- The samples are given oxygen gas plasma treatment with varying parameters such as time and electrode distances.
- Electrode plate distance had been set up as 4cm, 6cm and 8cm and time variations were 5 minutes, 10 minutes and 15 minutes.

5.2 DYEING AND ANALYSIS

- The samples which were either treated with oxygen and argon gas with different varying parameters are dyed using reactive/disperse dye.
- Reactive Dye: Temperature - 60°C & Time - 40mins
- Disperse Dye: Temperature - 130°C & Time - 1hour
- From the data collected the K/S value and the value for SEM (Scanning Electron Microscopy) analysis can be found.

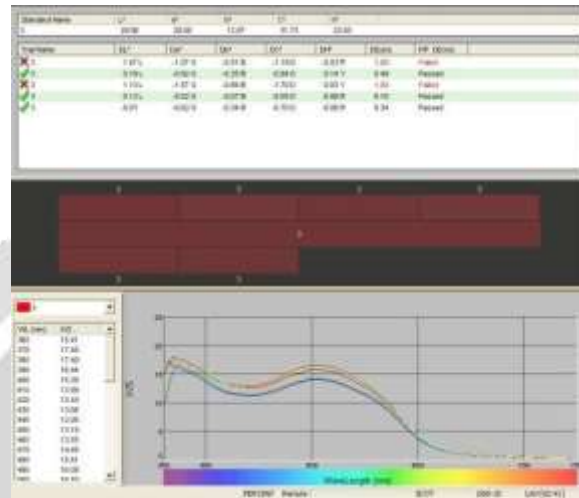
6. OBSERVATION

6.1 K/S VALUE ANALYSIS

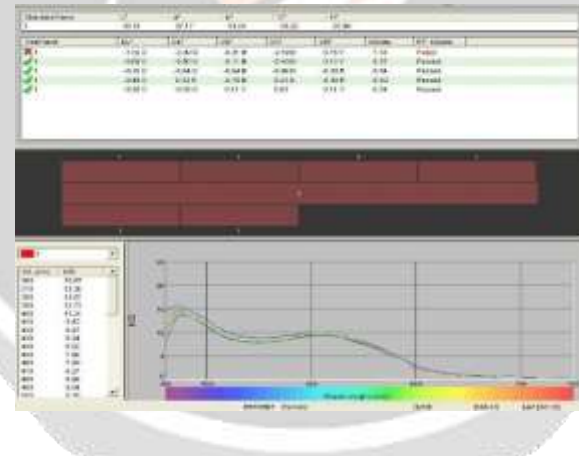
The conventional way to describe the behaviour of dyes on textile substrates is through the use of K/S values at the wavelength of maximum absorbance, which is also the reflectance minimum and thus the K/S value for the samples are found.

6.2 WITH PLASMA TREATMENT

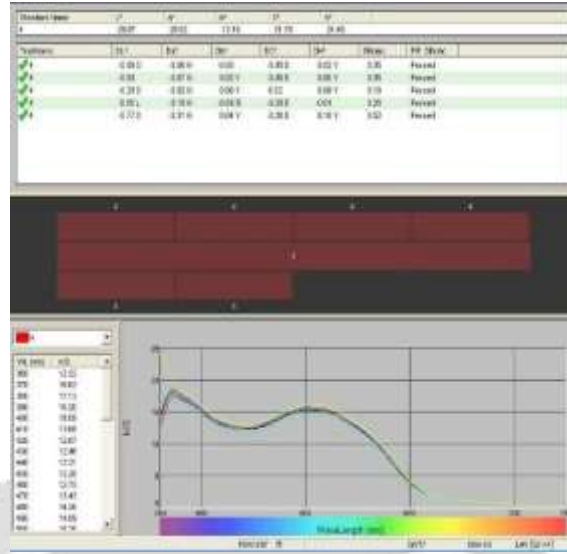
Electrode Distance: 4cm / Time: 5 minutes



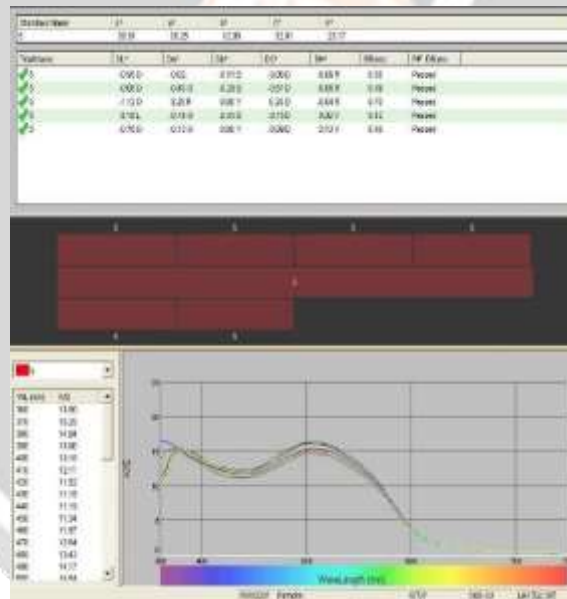
Electrode Distance: 4cm / Time: 15 minutes



Electrode Distance: 8cm / Time: 5 minutes

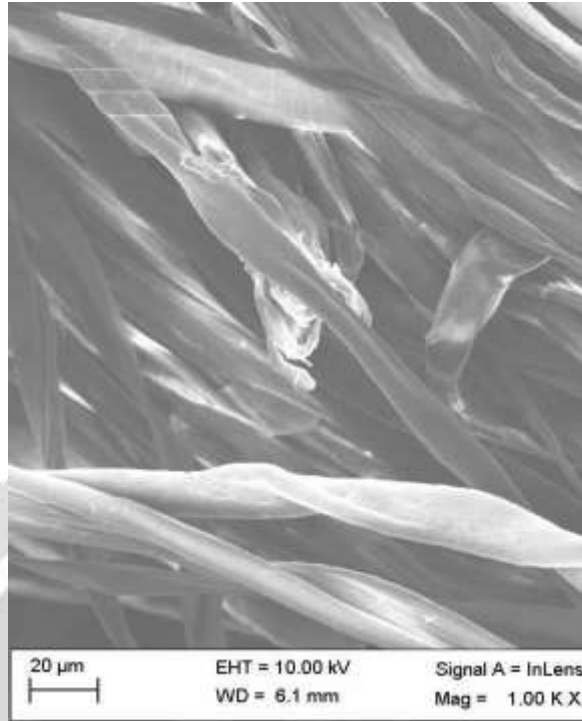


Electrode Distance: 8cm / Time: 15 minutes

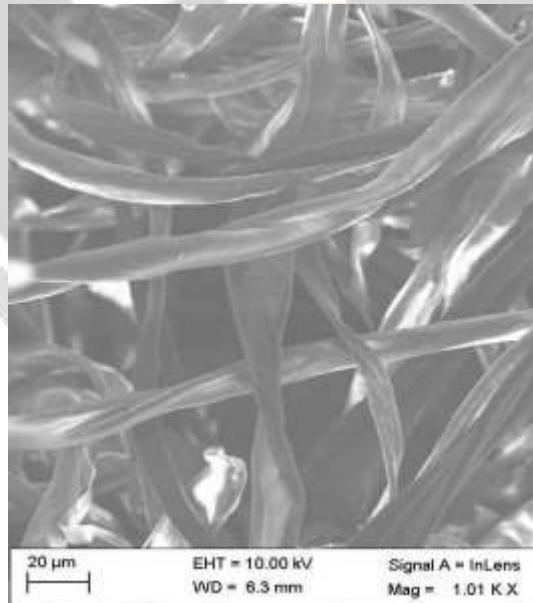


6.3 SEM ANALYSIS:

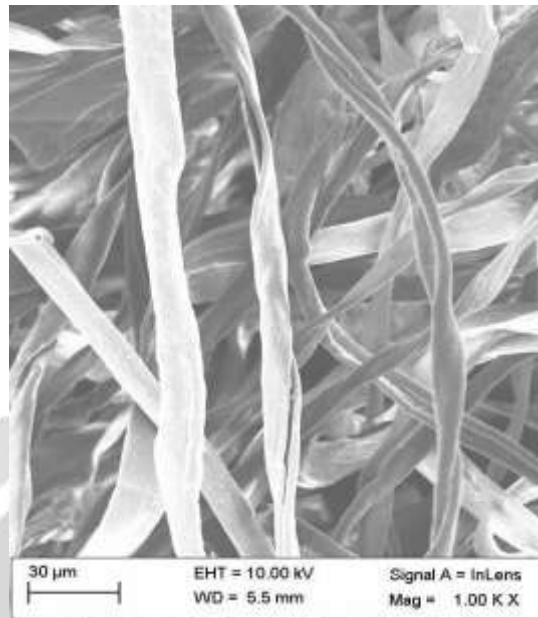
Electrode Distance: 4cm / Time: 5 minutes



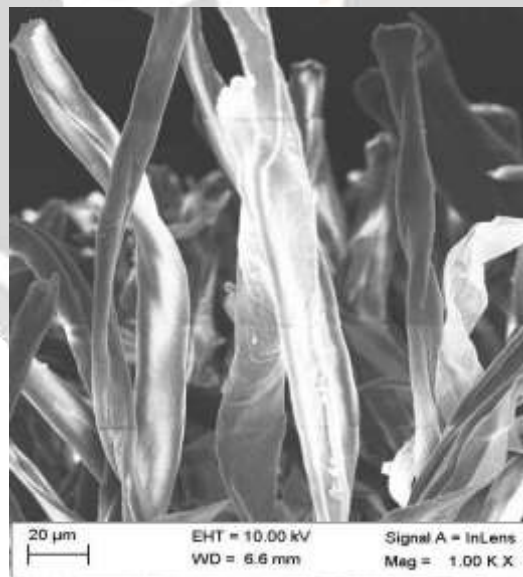
Electrode Distance: 4cm / Time: 15 minutes



Electrode Distance: 8cm / Time: 5 minutes



Electrode Distance: 8cm / Time: 15 minutes



6.4 WICKING TEST

S.NO	ELECTRODE DISTANCE: 4 CM/ TIME: 5 MIN	ELECTRODE DISTANCE: 4 CM/ TIME: 15 MIN	ELECTRODE DISTANCE: 6 CM/ TIME: 5 MIN	ELECTRODE DISTANCE: 6 CM/ TIME: 15 MIN	ELECTRODE DISTANCE: 8 CM/ TIME: 5 MIN
1	0.8	0.7	0.8	0.6	0.7
2	0.6	0.8	0.7	0.7	0.6
3	0.6	0.6	0.8	0.8	0.6
AVG.	0.7	0.7	0.8	0.7	0.6

7.CONCLUSION

From the results, it is observed that the fabric which is treated with oxygen gas plasma treatment under the parameters 6cm electrode distance and 5 minutes time showed better result when compared with others. From this study we conclude that the plasma treated samples showed better absorbency and dyeability compared to untreated samples. Also, by increasing the time of plasma treatment and increasing the distance between the electrode plates, plasma treatment was seen well.

In future work the project can be carried out in the following ways,

- Promotes sustainability (In future works recycled polyester can also be used).
- Improves hand feel property of the fabric.

8.REFERENCES

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