

Synthesis and Efficacy of Silver Nanoparticles on Textile Material Dyed with Different Dyes

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Abstract: Nano particles have a wide range of applications such as electronics, catalysis, chemistry energy and medicine and have thus gained commercial acceptance. Besides improving their functionality, the use of nano technology can result in the production of textiles with completely novel properties or the combination of various functions. Such multifunctional textiles include antistatic textiles, reinforced textiles, antibacterial, self-cleaning textiles, bleaching resistant, etc. and paves the way for the use of its products in other fields outside the traditional industries. Silver nano particles due to their strong and wide spectrum of antimicrobial activities have gained major focus among all nano particles. In order to protect against microbial contamination, silver has been incorporated into various forms of plastics such as catheters, dental material, medical devices, implants and burn dressings. These nano particles have also been used for durable finish on fabrics. This research focuses on the use of silver nanoparticles synthesized from Silver Nitrate by Insitu chemical reduction method and it is applied on different textile dyed material and study its efficacy.

Keywords: silver nano particles, silver nitrate, FESEM, EDAX.

1. Introduction

Over the last few decades, various research work was happening around the world made to produce antibacterial coated textile materials due to the enormous growth of microbial infections via textile surfaces. Attempts have been made to develop a non-toxic, cost effective and ecofriendly source of antimicrobial finishing textiles for health care application. Cotton fibres are mostly utilized as raw material towards medical and healthcare products. However, the moisture absorbability of cotton fibres is very high, which makes them more prone to microbial attack under certain conditions of humidity and temperature. Cotton may acts as a nutrient, becoming suitable medium for bacterial and fungal growth. Therefore, cotton fibres are treated with numerous chemicals to get better antimicrobial cotton textiles. Among the various antimicrobial treatments, nano material-based treatment is very effective. Silver nano particles (AgNPs) have shown strong inhibitory and antibacterial effects.

2. Materials and Methods

A. Materials

The textile material used are dyed woven fabrics.

Table 1

Sample	Material	Dye
1	Woven cotton fabric	VAT
2	Woven cotton fabric	Direct
3	Woven polyester fabric	Disperse
4	Woven silk fabric	Acid

Silver Nitrate and Tri Sodium Citrate are the other chemicals used.

B. Chemical Synthesis

Formation of Silver nano particles onto the synthetic fabrics from silver nitrate salt (0.5 % concentration) by synthesis of insitu chemical reduction method using Trisodium citrate as reducing agent to produce nano silver solution. Coating on dyed woven fabrics is done by dipping the fabric samples at room temperature for 12 hours in nano silver solution, then washed and dried at room temperature.

C. Characterization of Nanosilver

The morphology of nano silver textile was examined using Field Emission Scanning Electron Microscopy (FESEM) and Energy Dispersive Spectroscopy (EDS) is used to identify the presence of AgNP elemental composition on the textile material.

3. Results and Discussion

A. Analysis of Silver Nano particles with SEM

Dyed and coated woven fabric samples are analysed in FESEM at PSG CoE-Indutech. The presence of silver particles was confirmed on all the samples.



Fig. 1. VAT dyed woven cotton fabric

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Fig. 2. Direct dyed woven cotton fabric

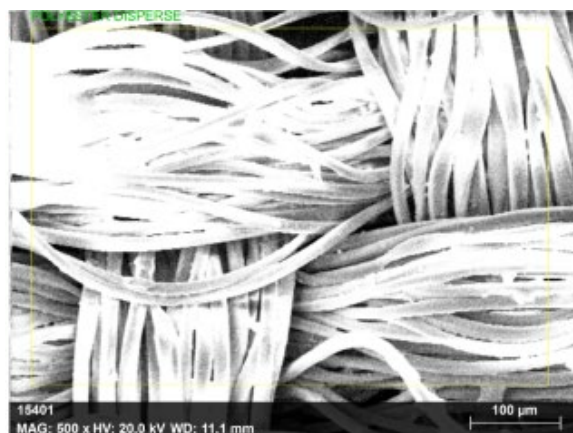


Fig. 3. Disperse dyed polyester fabric

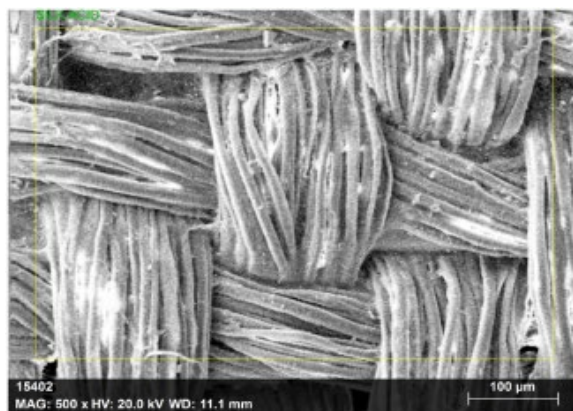


Fig. 4. Acid dyed woven silk fabric

B. Analysis of Elemental Composition with EDAX (elemental analysis)

To further confirm the presence of silver particles on the

coated woven fabric Disperse Dyed Polyester Woven Fabric is analysed by EDAX to confirm the presence of silver particles.

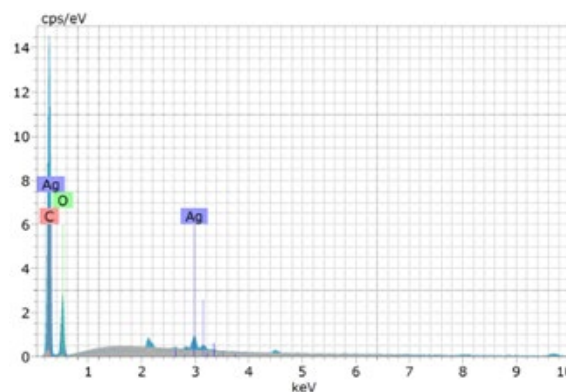


Fig. 5. EDAX analysis of disperse dyed polyester fabric

Table 2

Element Series (k)	Concentration in weight %	Atomic %
Carbon	63.00	71.53
oxygen	32.78	27.94
Silver	4.22	0.53

4. Conclusion

The results of FESEM analysis revealed the presence of silver all the samples of dyed woven fabric. Further the EDAX analysis on Dispersed Dyed Polyester Woven Fabric revealed the presence of Silver Particles on to the surface of the textile material. Further work on synthesis on silver nano particles on to the dyed textile material will enable us to provide antimicrobial activity for almost all dyed materials.

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