USING NANOTECHNOLOGY FOR NEW PRODUCT OF COTTON FABRIC

By

SAHAR EMAM MOHAMED EMAM SAUDI

B.Sc. Agric. Sci. (Biochemistry), Fac. Agric., Cairo Univ., Egypt, 2010

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

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In

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SUPERVISION SHEET

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ABSTRACT

In the present study zinc oxide (ZnO)nanoparticles which has many unique physical and chemical properties prepared by precipitation method using different concentrations of ZnO (1%, 3% and 5%) also using polyvinyl pyrrolidone(PVP) with different concentration (1% and 3%) as a binder and dyed (reactive dye). These nanoparticles have average size of 37-58 nm. It coated the bleached cellulosic fabric plain weave such as Giza80, Giza90 (100%cotton) and blended fabric (65/35%) with polyester. The results of this study found that the concentration of 3:3 of ZnO nanoparticles and PVP coated fabric was significantly higher than the control for the physical properties such as tensile strength, elongation, color strength (K/S) and evaluate wash fastness also characteristic size of ZnO NPS and the crystallinity of fabric by Fourier transmission infra red (FTIR), Scanning electron microscope (SEM) and X ray diffraction (XRD). The result also showed that the concentration of ZnO nanoparticles increased the crystallinity index also increased ZnO/PVP elevated UV protection in all varities. The highest response was G90 and G80followed by G70 blended with poly-ester. ZnO/PVP increased the antimicrobial activity against *E.coli* and *S. aureus* compared with the bleached fabric which killed about 99.8% of the bacterial cells. In conclusion by the present studies, it can be produced textiles had appearance on the surface textiles in dying process, UV protection and antimicrobial activity to use in medicine works.

Key words: Cotton fabric, ZnO nanoparticles, PVP, XRD, Strength, Elongation, FTIR Antimicrobial activity, Reactive dye

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LIST OF ABBREVIATIONS

DP	Degree of polymerization
C.R.I	Cotton research institute
PET	Polyethylene Tera phthalate
PVP	Poly vinyl pyrrolidone
NPs	Nanoparticles
FDA	Food and Drug Administration
UV	Ultraviolet
UPF	Ultraviolet protection factor
SEM	Scanning Electron microscope
TEM	Transmission Electron Microscopy
FTIR	Fourier Transmission Infra Red
XRD	X- Ray Diffraction
WAXD	Wide angle X-ray diffraction
Owf	On weight of fabric
NIS	National Institute for Standards
D	The diameter of the crystalline
Λ	The wave length of CuKαline (1.5406 A)
B	Full width at half maximum (FWHM) in radian
θ	Bragg angle
ROS	Reactive oxygen species
R	Decimal fraction of reflectance of dyed fabrics
K	Absorption coefficient
S	Scattering coefficient
TUVA	Transmitted Ultraviolet A rays (320- 400 nm)
TUVB	Transmitted Ultraviolet B rays (280 -320 nm)

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INTRODUCTION

Cotton is a natural fiber that comes from the seedpod of cotton plant used to make many fabric types at every price point, cotton can be knit or woven ,the common weaver for cotton are the plain and twill weave.

Cotton fabric is popular because it's easy to care and comfortable year-round in hot, humid weather, cotton breathes as the body perspires ,cotton fibers absorb the moisture and release it on the surface of the fabrics so it evaporates, in cold weather the fabric remains dry and the fiber retain body heat.

Nanotechnology has been involved in textile performances improvement or new functions for several years. In nanotechnology, the primary issues for researches is to examine the nano scale material so a variety of microscope approaches have been developed ,the most widely used nano coating process is summarized and the application of microscope analysis including electron microscopy ,scanning probe microscopy (SPM)and scanning electron microscope (SEM), transmission electron microscope (TEM).

Condition of cellulose textile manufacturing and operation presuppose contact with many issues such as microorganism, strength reduction, loss of aesthetic characteristic and performance properties. Therefore, zinc oxide (ZnO) has attracted considerable attention of many researchers especially for its low cost, easy process ability, low

weight, high quality surfaces and easy fabrication of thick and thin samples.