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FTIR AND SEM ANALYSIS FOR THE NANO ENCAPSULATED COTTON DENIM FABRIC AFTER 10, 20 AND 30 WASHES

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ABSTRACT

This paper elucidates about an eco friendly natural anti microbial finish has been prepared from the plant extracts for textile application. Herbal extracts from medicinal plants have been applied to cotton denim fabric by the method of Nanoencapsulation. All the treatments shown good antimicrobial properties and good washing durability up to 30 washes. The result of the antimicrobial activity is based on the standard test method AATCC 147 and AATCC 30 for evaluating antimicrobial efficiency. Finally FTIR and SEM analysis made on the treated cotton denim fabric and the results were discussed.

Key words: Antimicrobial, Antifungal, Nano encapsulation, FTIR, SEM Analysis

INTRODUCTION:

Anti-microbial finishes have increased its importance in the recent years for several reasons. They serve the buyer by offering assurance from the unsafe impacts of specific microorganisms. Microorganisms are minute creatures, yet can be generally hazardous for making mischief to our way of life in an unexpected way. Wellbeing and cleanliness are the essential prerequisites for people to live serenely and work with greatest proficiency. To shield the humanity from microbes and to stay away from cross disease an uncommon completion like antimicrobial completion has gotten important. Denim has acquired a lot of prevalence that in the event that you glance around, you will unquestionably see someone donning denim in your close by. Purchasers 'needs and needs are adjusted towards the most recent turns of events and recent trends; they are likewise mindful of extraordinary completes and interaction medicines given to the article of clothing to make them eco-accommodating and easy to understand[1].

Experimental procedure:

Herbal extraction

From the collected herbs the best three herbs were combined in the ratio 1:3:2 which are Jatropha (leaves and seeds), senna auriculata (leaves), and Euphorbia hirta (mixture of stem, leaf and flower). For these three plants the following extraction has been done.

Nanoencapsulation of herbal extracts

Nanoencapsulation is the covering of different substances inside one more material at sizes on the nano scale. This strategy is now ordinary inside a scope of businesses however it is acknowledged that just around 10% of potential applications are being taken advantage [2].

Selection of wall and core material

The exemplified material is regularly alluded to as the interior stage, the center material, the filler or the fill. The exemplification material is known as the outside stage, the shell, covering or layer .The herbal extracts prepared were encapsulated using bovine albumin fraction as the wall material and the nanoparticles as the core material.

Fabric treatment with herbal products

Direct application method

Methanol extracts of the herbs were directly applied on 100% cotton denim fabric by pad dry cure method. 2% of the home grown concentrate was applied on the texture alongside 8% citrus extract as cross connecting specialist by cushion dry fix technique. Cushioning was done in a pneumatic cushioning disfigure at 55 degree C [3].

Antimicrobial Test

The herbal treated cotton fabric were tested for the antimicrobial properties against gram positive as well as gram negative bacteria according to the AATCC method. Antimicrobial activities of the treated fabrics were evaluated by both quantitative (AATCC- 147) and quantitative (AATCC- 30) methods [4].

Wash Durability Test

The nano cases completed cotton texture was broke down for their wash toughness by exposing the example to washing and testing its antibacterial proficiency. The denim texture was exposed to washing by mechanical machines and the antibacterial movement of the washed texture was surveyed by AATCC 147 test strategy [6].

RESULTS AND DISCUSSION

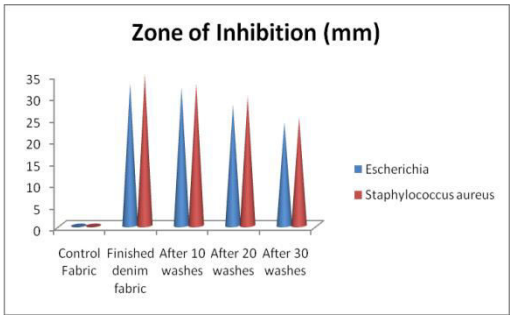
The results pertaining to the study are discussed under the following headings:

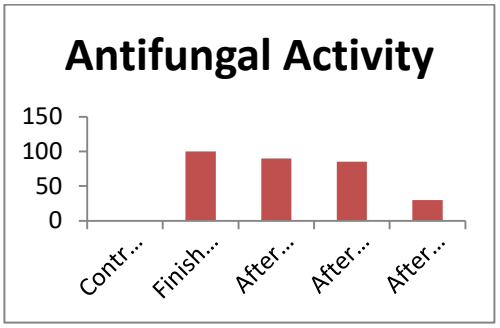
Antibacterial Activity (AATCC147):

The cotton fabric with antimicrobial finish using Nano encapsulation method showed maximum antibacterial activity. The result indicates the durability of fabric up to 30 industrial washes.

Antifungal Activity (AATCC 30):

The antifungal activity of treated cotton denim fabrics before and after 10, 20 and 30 industrial washes was evaluated. In the fabric before washing antifungal activity was observed by 100% mycelial reduction. The results analyzing antifungal activity of treated fabric before and after washes were shown good antifungal activity.

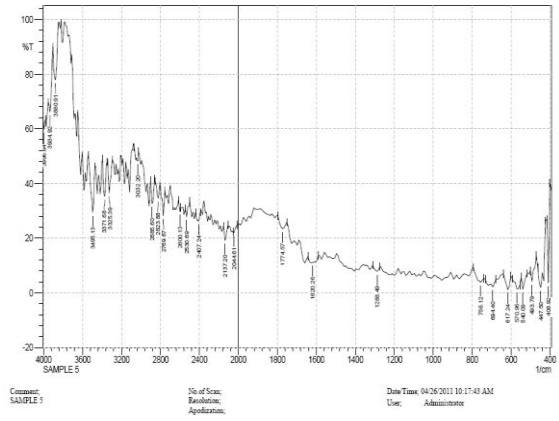




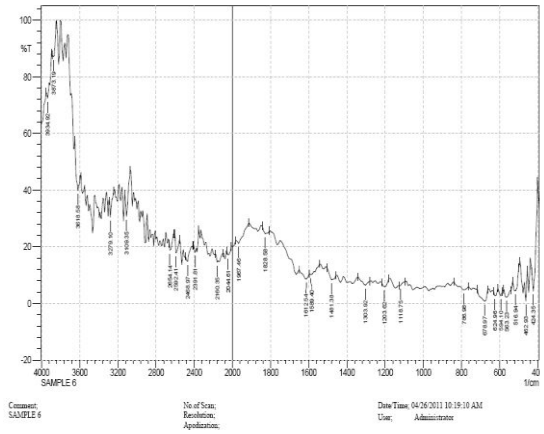
FTIR ANALYSIS OF THE FABRIC:

The FTIR analysis was done for Nano encapsulated finished fabric before wash and after 10, 20 and 30 washes of treated cotton denim fabric. When the FTIR spectrum of untreated and treated fabrics were compared, it was found that almost all the absorption peaks were modified upon treatment with Nano encapsulated finishes. FTIR is a method that utilizes infrared light to notice properties of a texture. It is utilized in a wide range of uses to gauge the retention, discharge, and photograph conductivity of issue by focusing a thin light emission light at the matter in different frequencies and distinguishing how the matter reacts to every frequency. The following were the charts for FTIR analysis for the treated fabrics before wash and after washes [7].

finished fabric before washing

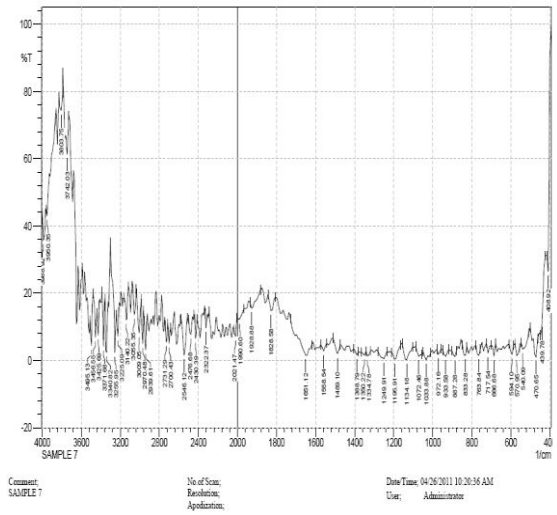


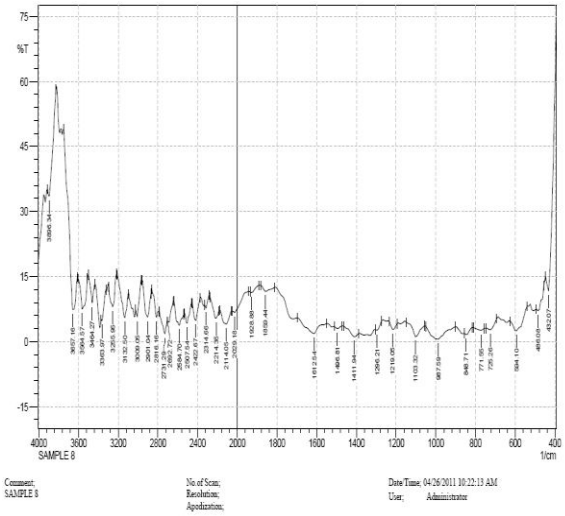
finished fabric after 10 washes



finished fabric after 20 washes

finished fabric after 30 washes

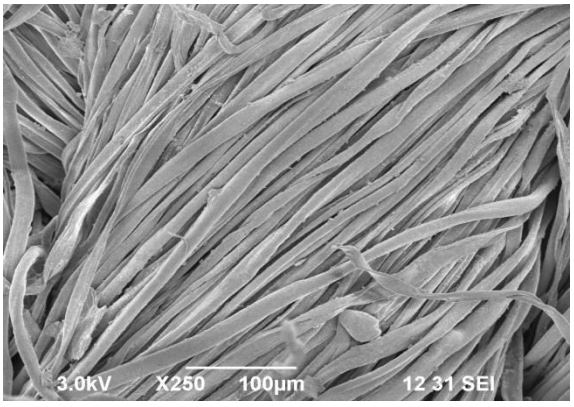




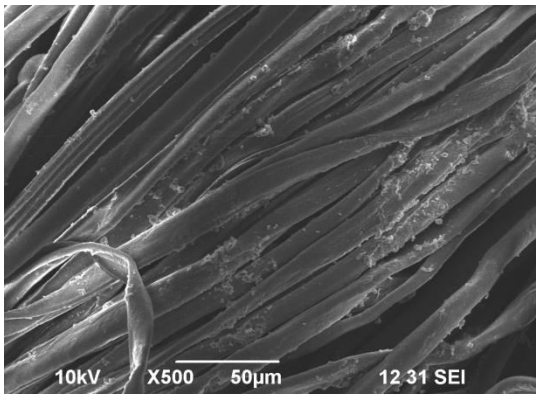
SEM ANALYSIS:

The outside of treated cotton denim texture previously, then after the fact washes was broke down by checking electron magnifying lens to notice the size and state of the Nano capsules. The Nano encapsulated coatings were observed on surface of the cotton denim fabric. The Nano capsules were well dispersed on the fabric surface. Examining electron magnifying instrument investigation was done to quantify the size of Nano cases. The molecule size assumes an essential part in deciding their bond to the texture. It is sensible to expect that the biggest particles will be effectively eliminate from the fibre surface, while the little particles will enter further and follow firmly into texture. The SEM examination of the treated textures showed Nano particles installed on to the textures [8].

Finished fabric before washing

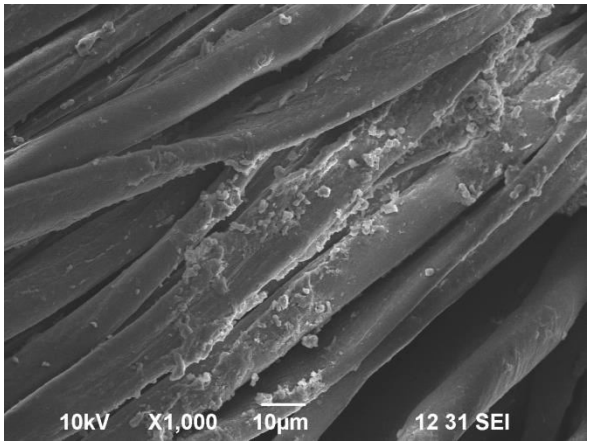


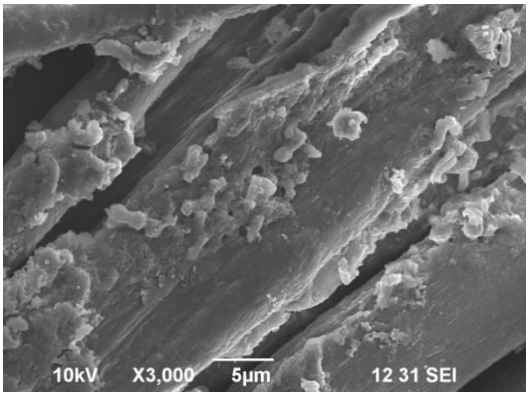
finished fabric after 10 washes



finished fabric after 20 washes

finished fabric after 30 washes





CONCLUSION:

The FTIR and SEM analysis were done for the sample A, B, C and D. the results were compared and concluded as almost all the absorption peaks were modified upon treatment with Nano encapsulated finishes. The surface of treated cotton denim fabric A, B, C and D was analysed to observe the size and shape of the Nano capsules. The Nano encapsulated coatings were observed on surface of the cotton denim fabric. The Nano capsules were well dispersed on the fabric surface. From the SEM images it is assumed that Sample A have 100% efficiency of the finish applied on it. The other samples B, C and D have the efficiency of 90%, 75% and 50% respectively. The present investigation shows that the fabric is environment friendly without any harmful chemicals. Hence the finished antimicrobial fabric is considered to be an eco-friendly fabric.

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