PLASMA TREATED HERBAL WOUND DRESSING

A PROJECT WORK

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

In this project, we are fabricating the wound dressing material from Bamboo and cotton fibers and then extract will be prepared from herbal plant (TULSI). The Herbal plant naturally contains antimicrobial properties .To treat the cotton and bamboo with plasma. Then Application of herbal extract on plasma Treated material and untreated material and assess the antimicrobial activity. Advantage of this project is, it easily and quickly cures wound. Finally we check how effectively plasma treated herbal material works.

INTRODUCTION

CHAPTER 1

INTRODUCTION

Medical textile is one of the fastest growing sectors of the technical textiles industry.

Many researches and developments are coming day by day. In this project "**HERBAL FINISHING FOR WOUND DRESSINGS**", herbs which are not known by many people are being used.

The commonly available herbs, having antimicrobial property in nature are taken for this proje They are fabricated with cotton and bamboo and thus the wound dressings are made.

1.1 OBJECTIVES

- Herbal Extraction is prepared from the following Plant.

  OCIMUM SANCTUM

- To treat the Cotton and bamboo with plasma.
- Application of herbal extract on plasma Treated material and untreated material.
- Assessment of the antimicrobial activity.
- Influence of plasma treatment on antimicrobial property of the knitted cotton and bamboo fabrics.
- Compare the both the material characteristics.

LITERATURE REVIEW

CHAPTER 2

2.1 OCIMUM SANCTUM

This leaf extract has wound-healing activity in Sprague dawley rats.

Uses

- It is considered as India's Queen of herbs. They are largely used in ayurvedic medicines. It has g medicinal properties as well as cosmetic properties.
- Water boiled with tulsi leaves is good for sore throat. It can also be gargled.
- Chewing tulsi leaves treats cold and flu.
- Tulsi leaf when eaten in the morning purifies blood.
- It can be used as tooth powder by drying its leaves and mixed with water.
- It helps in protecting the entire respiratory tract.
- Its has many cosmetic properties and used in herbal soap and also for body scrub. Tulsi oil can be use for controlling dandruff.
- The objective of our study was to evaluate the antimicrobial and wound healing activity of the le extract of OCIMUM SANCTUM

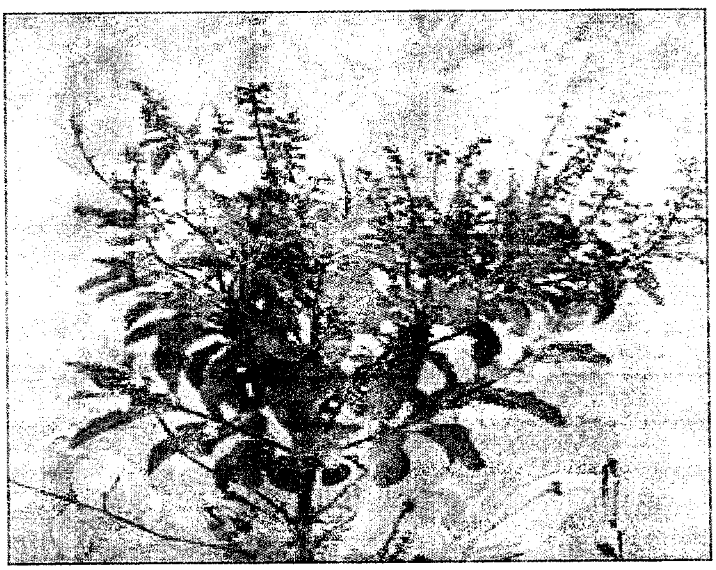


Fig 2.1

2.2 ABOUT COTTON

- Cotton is a natural fibre and it is harvested from the cotton plant.
- The properties of cotton are many – it is soft, versatile and strong – to mention a few.
- These qualities make it ideal for clothing and many other items.
- In fact, no other material is quite like cotton.

Fig 2.2

The most important properties are:

- It is soft
- It "breathes"
- It absorbs body moisture
- It is comfortable
- It is strong and durable
- It is versatile
- It performs well
- It has good colour retention
- It is easy to print on
- It is easy to care for, easy to wash
- It is a natural resource that is fully renewable.

2.3 ABOUT BAMBOO

Bamboo fiber is praised as the natural green and eco-friendly new type textile material of 21^{st} centu Bamboo is called "THE NEW COTTON" and people are talking about "TEXTILE REVOLUTION". Bamb fibers are the newest thing to hit textile area and have a number of applications. Bamboo fiber and starc pulp are made from bamboo that grows widely through Asian countries. Starchy pulp is refined product bamboo stems and leaves through a process of hydrolysis-alkalization and multi phase bleachi

Because the cross-section of the fiber is filled with various micro-gaps and micro-holes, it has mu better moisture absorption and ventilation. Moisture absorbency is twice than that of cotton with extraordina soil release.

Natural antibacterial elements (bio-agent "bamboo kun") in bamboo fiber keep bacteria away fr bamboo fabrics.

Bamboo grows quickly requiring few farming inputs and no pesticides. When compared to other fib such as cotton it is more sustainable. Bamboo takes up more green house gases and releases more oxygen a does not need a replanting or fertilizer. www.bamboofabrics.com

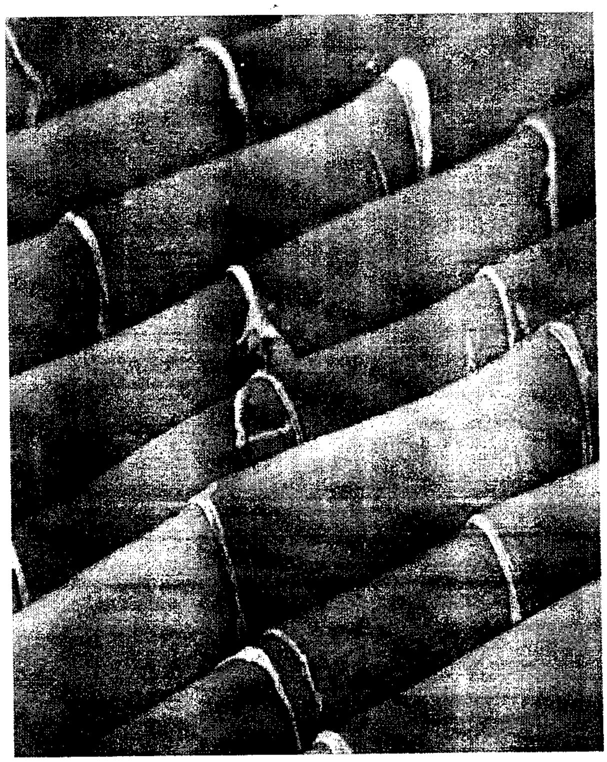


Fig 2.3

2.4 WOUND HEALING

Wound is defined simply as the disruption of the cellular and anatomic continuity of a tissue. Woun may be produced by physical, chemical, thermal, microbial or insult to the tissue.

Wound healing is a complex and dynamic process that varies according to the type and location of the wound.

Surgical wounds closed by sutures require very little remodeling whereas larger wounds such immunological as pressure ulcers require considerable tissue reconstruction. Generally however, from injury to resolution, wounds go through four phases…

1. Homeostasis -The stopping of bleeding.
2. Inflammation -Whilst the damaged tissue is preventing further blood loss by vasoconstriction and clotting.
3. Proliferative -Homeostasis and inflammation have contained the emergency and stabilize the situation and now the body needs to start the repair process.
4. Remodeling.

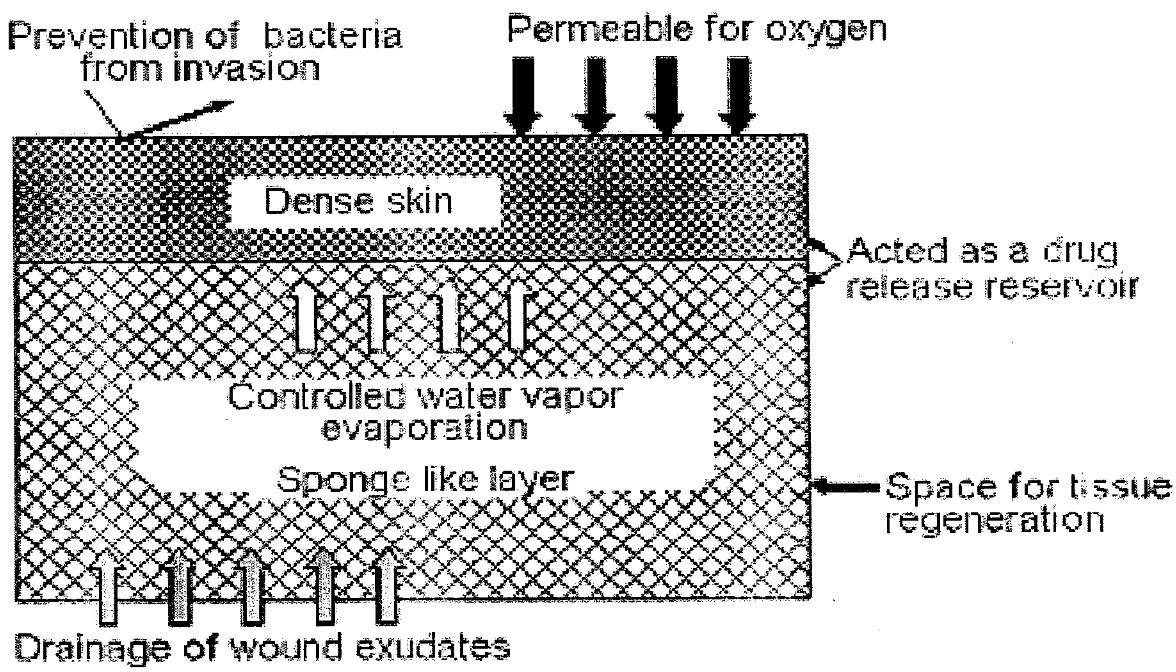


Fig 2.4

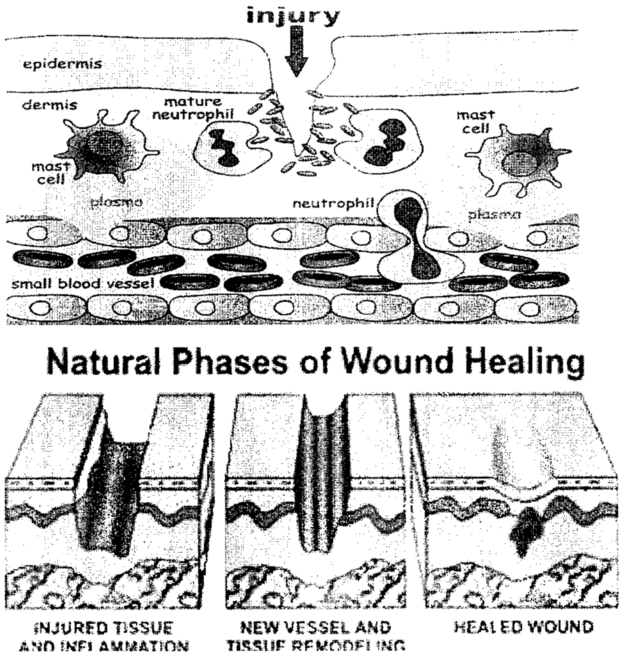


Fig 2.5

Evaluation of wound healing potential of Bauhinia purpurea leaf extracts in rats

The present study was carried out to evaluate the effect of methanol and chloroform extracts Bauhinia purpurea on experimentally induced excision, incision, burn and dead space wound models Sprague Dawley rats.

Formulations of methanol and chloroform extracts of Bauhinia purpurea were prepared in carbop and simple ointment base at concentrations of 2.5% and 5% and applied to the wounds. In the excision a burn wound models, animals treated with high doses of methanol and chloroform showed significa reduction in time taken for epithelization and wound contraction (50%) compared to control.

A significant increase in breaking strength was found in incision wound model with methanol a chloroform extracts compared to their respective bases. In the dead space wound model, methanol and chloroform extract treatment (100 and 500 mg/kg) orally produced a significant increase in the breakin strength, dry tissue weight and hydroxyproline content of the granulation tissue when compared to control.

Among the extracts, methanol extract exhibited more activity followed by the chloroform extract. conclusion, the present study indicated that Bauhinia purpurea leaves exhibited wound healing activity.

2.5 PLASMA TREATMENT IN TEXTILE

2.5.1 Introduction:

- Plasma, the so called fourth state of matter, is a partially ionised gas. Some of the atoms and molecul in plasmas would have lost at least one electron, that is, they are ionised.
- The fraction of such atoms need not be high. Degree of ionisation could be fraction of a percent. Th a plasma would have ions, electrons, neutral atoms and molecules.
- These would be moving around randomly colliding with each other which may result in emission light, creation of excited particles and so on. Any solid object introduced into the plasma, includi the walls of the container, is continuously bombarded by plasma particles.
- Electrons and ions hitting the solid object also create an electric field near the surface.This increas the energy of the bombarding ions. Depending on the type of particle and its energy the surfa properties of the material exposed to the plasma can get modified in different ways. Plasma nitridi surface coating, increasing of surface energy to achieve a hydrophilic surfaces are some examples.
- Plasmas come in different varieties. A major classification distinguishes between non equilibrium l pressure plasmas and high pressure equilibrium plasmas. In non-equilibrium plasmas the electro and ions would have different temperatures or energies. Collisions are few in such low pressu plasmas and generally electrons are more energetic than ions and other species.
- The electron temperatures could be pretty high ~ 10 5 K. But the overall energy content is low. N equilibrium plasmas are found in fluorescent lamps, sodium vapour lamps etc. On the other hand, equilibrium plasmas all species i.e. ions, electrons and neutrals are at the same temperature wh could be between 5000oK to 10,000oK.
- As the pressures are high total energy content would be high. These are essentially localized sour of high power. They are used electric welding, plasma cutting etc.

- Non equilibrium plasmas are more interesting. Their interaction with matter is species and energ specific. Such plasmas can be tailored to achieve a variety of properties.

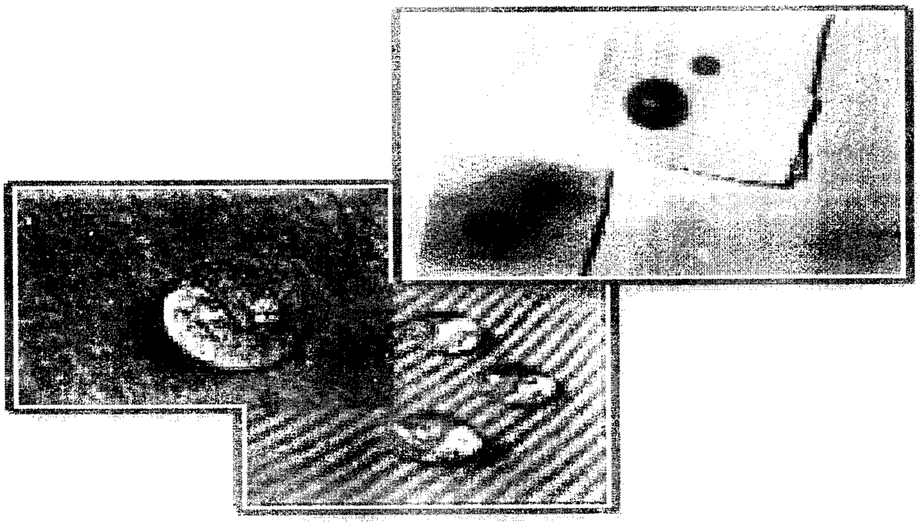


Fig 2.6

- The surface properties alterations obtained by a plasma treatment are complex. Particle induc reactions take usually place in the upper ten nanometers of a surface.
- Short wavelength UV-radiation as it is emitted by low pressure plasmas initiates reactions in thicker layer (about 100 nm). The relation between the two and the extent of both can be controlled the process gas and other process parameters.
- The outermost surface, only some atom layers, sometimes less than 1 nm, determines the interacti with other media.
- The chemical composition of this part of a fiber is responsible for good or bad adhesion in laminat or whether the fabric is suitable for impregnation or not.
- Exactly this part of a fiber can be modified by a plasma. For the success of the treatment not only t process parameters contribute, but also the original surface is crucial. Trace amounts of sizings, example, can modify the reaction condition substantially and have to be taken into consideration almost every process.

2.5.2 Technology

Many different types of treatments have been done so far in batch experiments. This is a legitima way to demonstrate that a certain treatment can create a desired effect. However, for an industrial applicati a continuous process is inevitable. There are basically two types of vacuum equipment to realize a continuo web treatment: In an air-to-air system the material passes several differential pumping stages before it reach the actual process chamber and after it had left it. This allows a real continuous treatment and is particular suitable if one material is treated in one process for a long period of time without changes.

The metalization of polymer films is done with this technology. For the treatment of differe materials, a semi-continuous or roll-to-roll technique is usually more reliable. Deviations of the materia properties as for example thickness and water content can be controlled easier than in a continuous treatme In particular for technological investigations this is the way to go.

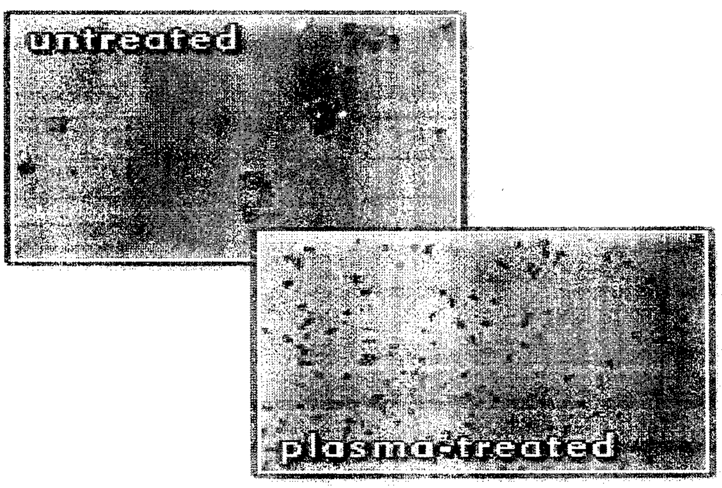


Fig 2.7

2.5.3 Processing Methods

- **Oxygen or air plasma**
  - Removes organic contaminants by chemical reaction with highly reactive oxygen radicals a ablation by energetic oxygen ions
  - Promotes surface oxidation and hydroxylation (OH groups); increase surface wettability
  - Oxidation may be undesirable for some materials (e.g. gold) and can affect surface properties
- **Argon plasma**
  - Cleans by ion bombardment and physical ablation of contaminants off the surface
  - Does not react with the surface or alter surface chemistry
- **Carbon Tetra Fluoride (CF4) plasma**
  - Forms hydrophobic coating of fluorine-containing groups (CF, CF2, CF3)
  - Decreases number of hydrophilic polar end groups on surface; decreases surface wettability.
- Surfaces should be used immediately after plasma treatment; plasma-treated surfaces may recover th untreated surface characteristics with prolonged exposure to air.
- Suggested process parameters values for plasma treatment using a Harrick Plasma cleaner (so experimentation may be required to determine optimal process conditions).
  - Pressure: 100 mTorr to 1 Torr
  - RF power: Medium or High
  - Process time: 1-3 minutes

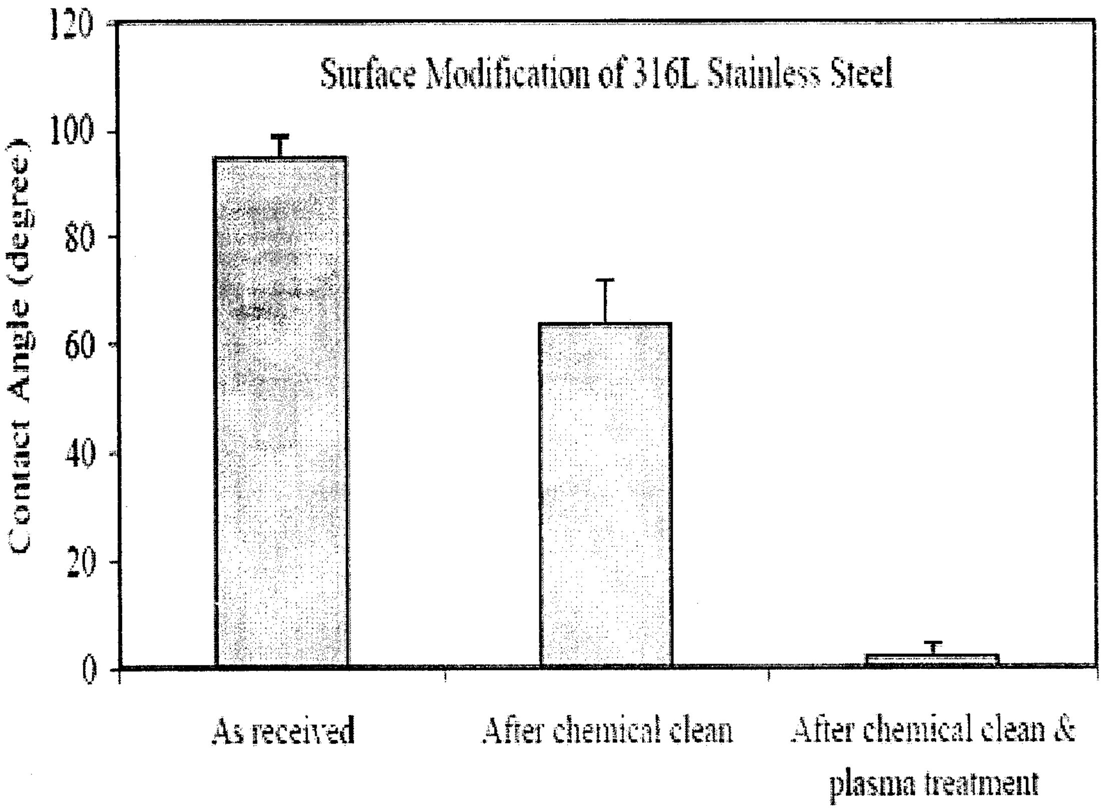


Figure 1. Water drop contact angle measurement on 316L stainless steel (a) as received, (b) after chemic clean (ultrasonication in 70% ethanol, acetone, and 40% nitric acid), and (c) after chemical clean and C plasma treatment using a Harrick Plasma cleaner.

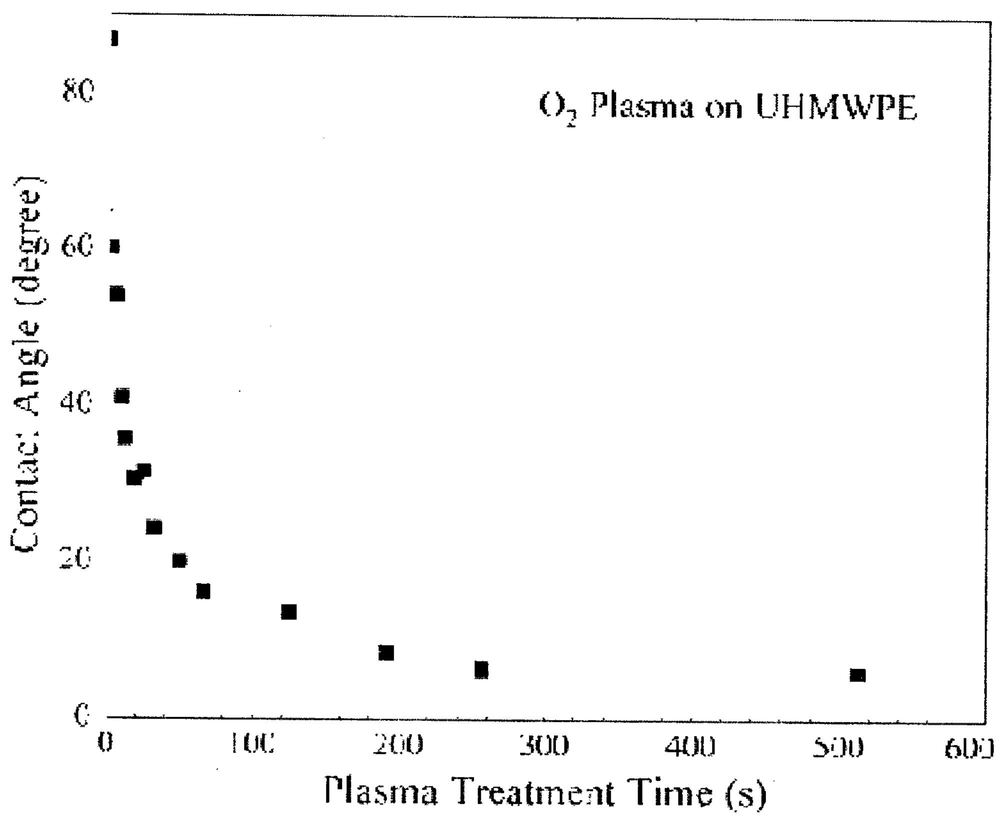


Figure 2. Water droplet contact angle measurement on ultrahigh molecular weight polyethylene (UHMWPE as a function of O2 plasma treatment time using a Harrick Plasma cleaner.

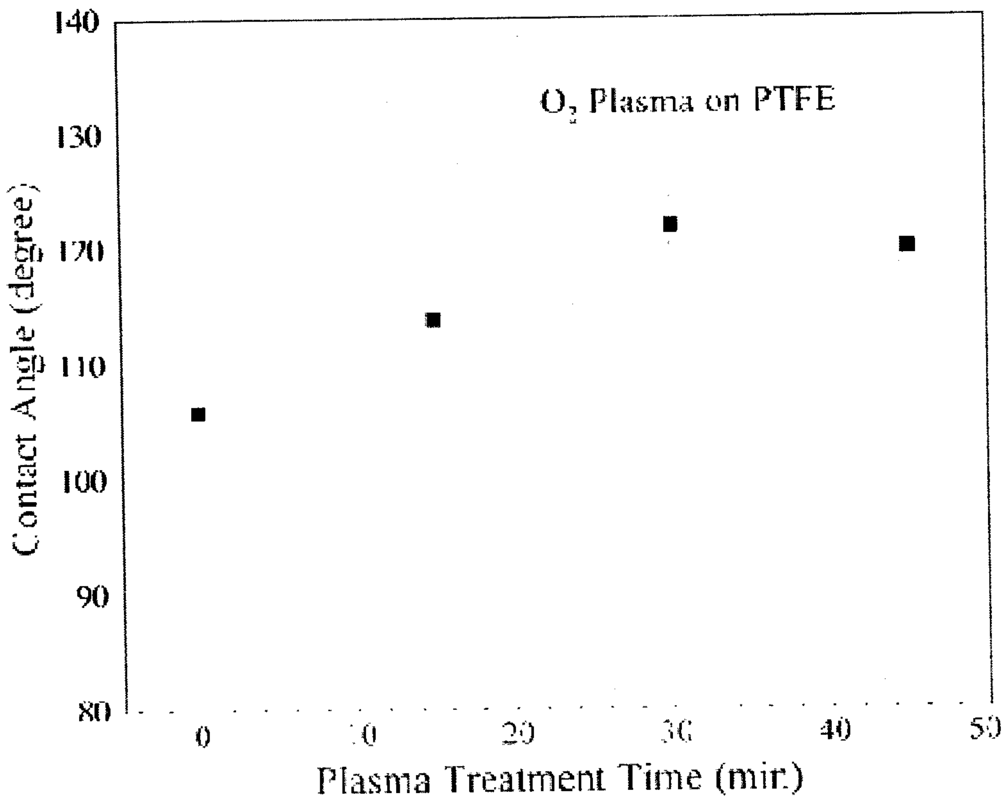


Figure 3. Water droplet contact angle as a function of O2 plasma treatment time, using a Harrick Plas cleaner, on poly(tetrafluoroethylene) (PTFE), indicating increased hydrophobicity. Plasma treatment produ nanoscale roughness that increases hydrophobicity.

2.5.4 Benefits of Plasma Treatment

- Remove residual organic impurities and weakly bound organic contamination
- Prepare surfaces for subsequent processing (e.g. film deposition or adsorption of molecules)
- Improve surface coverage and spreading of coatings and enhance adhesion between two surfaces
- Modify wettability to render a surface hydrophilic or hydrophobic with the appropriate proc gas(es)
- Affect only a few monolayers of the surface; does not change bulk properties of the material
- Can treat a wide variety of materials as well as complex surface geometries; examples include:
  - Semiconductor wafers and substrates (Si, Ge)
  - Glass slides and substrates.
  - Oxides (quartz, indium tin oxide (ITO), TiO2, Al2O3); mica

2.5.5 Applications

- Surface preparation of substrates prior to self-assembly experiments
- Surface preparation of electron microscopy (EM) sample grids
- Plasma cleaning of printed circuit (PC) boards and die surfaces prior to bonding
- Plasma treatment of dental implant and impression mold materials
- Plasma treatment of biomaterials and biomedical devices prior to functionalizing surface
- Plasma treatment of fibers to improve adhesion to matrix in fiber-reinforced composite materials
- Study of adhesion characteristics of dissimilar materials by mechanical testing or atomic forc microscopy (AFM) force measurements

2.5.6 EFFECT OF PLASMA TREATMENT ON SOME PROPERTIES OF COTTON

- Treatment of cotton fibres has been studied in air and oxygen plasma and the treat- ment time, natur and flow rate of the gas, and plasma power have been varied. In order to establish the chemical effe of plasma treatment on cotton fibres the fol- lowing tests have been performed:
- Cuprammonium fluidity test, weight loss measure- ment, determination of carboxyl groups, carbony group identification, FTIR analysis and measurement of the ASTM yellowness of the untreated an plasma treated cotton fab- rics. In addition, vertical wicking studies and the effect of ageing of th plasma treated samples on the rate and the amount of dye uptake have been investigated.
- The plasma treatments lead to surface erosion of the cotton fibres which generates a weight los accompanied by an increase in the fibre carboxyl group and carbonyl group contents.
- The increase in fibre carboxyl group content leads to a more wettable fibre and the rate of fabri vertical wicking is increased.
- The direct dye (chloramine Fast Red K) uptake of treated samples increases almost linearly with th increase in fibre carboxyl group con- tent caused by plasma treatment, but progressively decrease with increase in the age- ing time after oxygen plasma treatment. Ageing after plasma treatment als increases the fabric yellowness.

2.6 EXTRACTION METHODS

Two methods:

1. Cold Method.

   - Shaking Method

2. Hot Method

   - Soxhlet Apparatus

1.Shake method

The extract is taken in a flask, mixed with water and is shaked continuously for 2-3 days.

2.Soxhlet Apparatus

Soxhlet extraction is only required where the desired compound has a limited solubility in a solvent, a the impurity is insoluble in that solvent. If the desired compound has a significant solubility in a solvent the simple filtratioFruit extraction in progress. The sample is placed in the thimble.

Normally a solid material containing some of the desired compound is placed inside a thimble made from thick filter paper, which is loaded into the main chamber of the soxhlet extractor.

The soxhlet extractor is placed onto a flask containing the extraction solvent. The soxhlet is then equipped with a condenser.

The solvent is heated to reflux. The solvent vapour travels up a distillation arm, and floods into the chamber housing the thimble of solid.

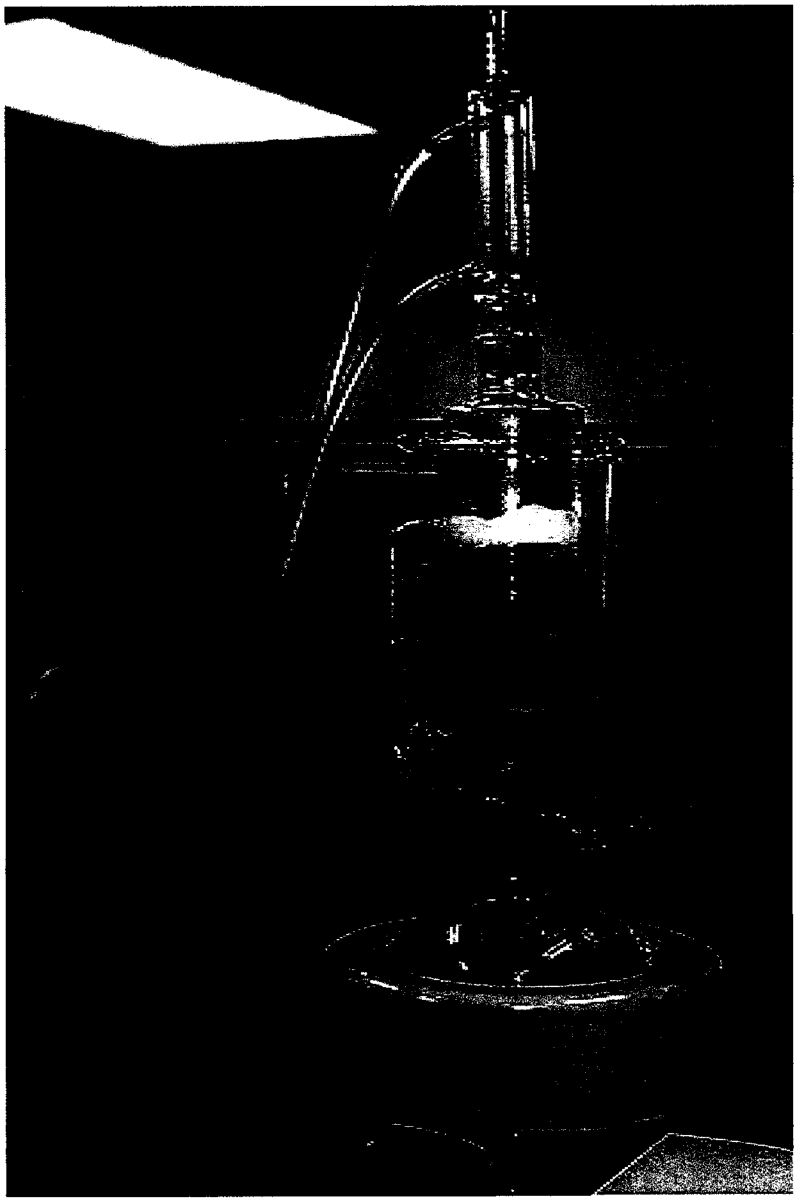


Fig 2.9

The condenser ensures that any solvent vapour cools, and drips back down into the chamber housin the solid material.During each cycle, a portion of the non-volatile compound dissolves in the solvent. Afte many cycles the desired compound is concentrated in the distillation flask.

The advantage of this system is that instead of many portions of warm solvent being passed throug the sample, just one batch of solvent is recycled. After extraction the solvent is removed, typically by mean of a rotary evaporator, yielding the extracted compound.

The non-soluble portion of the extracted solid remains in the thimble, and is usually discardec The chamber containing the solid material slowly fills with warm solvent. Some of the desire compound will then dissolve in the warm solvent.

When the soxhlet chamber is almost full, the chamber is automatically emptied by a siphon side arn with the solvent running back down to the distillation flask. This cycle may be allowed to repeat many time: over hours or days.

2.7 FABRIC TREATMENT WITH HERBAL PRODUCTS

2.7.1. Direct Application Method

Ethanol extracts of the herbs were directly applied on 100% cotton fabric by pad-dry-cure method.1% (the herbal extract was applied on cotton fabric along with 6% citric acid as cross-linking agent by pad-dr cure method. Padding was carried out in pneumatic padding mangle at a pressure of 3 psi to get a pick up (100% on weight of fabric. Drying and curing were carried out in spooner at 80 c for 5 min and 150 c for 3 m respectively.

2.7.2.Micro-encapsulation Method

Micro-encapsulation is one of the novel methods of getting functional finishes on textiles.Its a proce by which very tiny droplets of liquid or particles of solid are covered with a continuous film of polyme material.Micro-encapsulation is more advantageous to conventional processes in terms of economy,ener saving,ecofriendliness and controlled release of substance.The agents reside in colloidal suspension within t amorphous zone of the binder so that a reservoir of agent is present in solid solution within the polym matrix.Such treated fabrics were reported to be durable to a few number of wash cycles.The prolong bioactivity of the fabric is due to slow diffusion of the antimicrobial agent out of the polymer reservoir.In t present work,micro-encapsulation was done using herbal extract as core material and gum acacia as w materials.Ten grams of acacia powder was allowed to swell for 15 min in 100 ml of hot water.To th mixture,50 ml of hot water was added and stirred for 15 min maintaining the temperature between 40 c and c.One and a half gram of core material(herbal extract) was slowly added under stirring condition.Stirring w continued for another 15 min and then 10 ml of 20% sodium sulphate and 6 g of citric acid were added.T stirring was stopped and the mixture was freeze dried in a freezer to develop microcapsules solution a padded through pneumatic padding mangle at a pressue of 3 psi.The treated fabric was dried at 80 c for 5 mi

2.7.3 Cross-Linking method

One gram of herbal extract was mixed with 100ml (120 gpl conc.) non-formaldehyde bas resin(KRISOF NIL/F) and 2.0g MgCl2 was added as a catalyst.Cotton fabric was dipped in the resin soluti and padded through a pneumatic padding mangle.The treated fabric was dried at 80 c for 5 min and cured 150 c for 3 min.

2.8. TESTING METHODS

2.8.1 ANTIMICROBIAL PROPERTIES

Enhancing the Antibacterial Properties of Cotton Fabric

Attempts were made to enhance the antibacterial properties of the cotton fabrics via pr crosslinking with tri-methylol melamine followed by subsequent treatment with iodine (NH and NI) solutic to create new active sites. The treated fabric shows the ability to inhibit as well as to arrest the growth of bo of the bacillus subtilis and Escherichia coli. The antibacterial activity is determined by the degree modification, the extent of iodine retention, as well as the ease of iodine liberation. Repeated laundering- recharging cycle could fully bring back the antibacterial functions of the finished cotton fabrics.

Durable Press and Antimicrobial Finishing of Cotton Fabrics with a Citric Acid and Chitosa Treatment

Citric acid (cA) and chitosan are used as durable press and antimicrobial finishing agents for cotto and are applied by means of the conventional pad-dry-cure process. CA is expected to react with hydrox groups in cellulose and chitosan or with amino groups in chitosan to form ester crosslinking or an inter-ion attraction. Durable press appearance ratings of 3.5-4 are imparted with CA and chitosan treatments. Tl cotton fabric treated with CA alone shows antimicrobial properties. These and durable press performance a retained through twenty washing and tumble drying cycles. Strength retention improves more with CA aı chitosan than with CA alone.

2.8.2 SCANNING ELECTRON MICROSCOPE (SEM)

A typical SEM instrument, showing the electron column, sampl chamber, EDS detector, electronics console, and visual displa monitors.

The scanning electron microscope (SEM) uses a focused beam c high-energy electrons to generate a variety of signals at the surface c

Fig 2.10

solid specimens. The signals that derive from electron-sample interactions reveal information about tl sample including external morphology (texture), chemical composition, and crystalline structure ar orientation of materials making up the sample. In most applications, data are collected over a selected area the surface of the sample, and a 2-dimensional image is generated that displays spatial variations in the properties

. Areas ranging from approximately 1 cm to 5 microns in width can be imaged in a scanning mo using conventional SEM techniques (magnification ranging from 20X to approximately 30,000X, spat resolution of 50 to 100 nm). The SEM is also capable of performing analyses of selected point locations the sample; this approach is especially useful in qualitatively or semi-quantitatively determining chemic compositions (using EDS), crystalline structure, and crystal orientations (using EBSD).

The design and function of the SEM is very similar to the EPMA and considerable overlap capabilities exists between the two instruments.

Fundamental Principles of Scanning Electron Microscopy (SEM)

Accelerated electrons in an SEM carry significant amounts of kinetic energy, and this energy dissipated as a variety of signals produced byelectron-sample interactions when the incident electrons decelerated in the solid sample. These signals include secondary electrons (that produce SEM imag backscattered electrons (BSE), diffracted backscattered electrons (EBSD that are used to determine crystal structures and orientations of minerals), photons (characteristic X-rays that are used for elemental analysis ar continuum X-rays), visible light (cathodoluminescence--CL), and heat. Secondary electrons and backscatter electrons are commonly used for imaging samples: secondary electrons are most valuable for showi morphology and topography on samples and backscattered electrons are most valuable for illustrati contrasts in composition in multiphase samples (i.e. for rapid phase discrimination). X-ray generation produced by inelastic collisions of the incident electrons with electrons in discrete ortitals (shells) of atoms the sample. As the excited electrons return to lower energy states, they yield X-rays that are of a fix wavelength (that is related to the difference in energy levels of electrons in different shells for a give element). Thus, characteristic X-rays are produced for each element in a mineral that is "excited" by t electron beam. SEM analysis is considered to be "non-destructive"; that is, x-rays generated by electr interactions do not lead to volume loss of the sample, so it is possible to analyze the same materia repeatedly. **Scanning Electron Microscopy (SEM) Instrumentation - How Does It Work?**

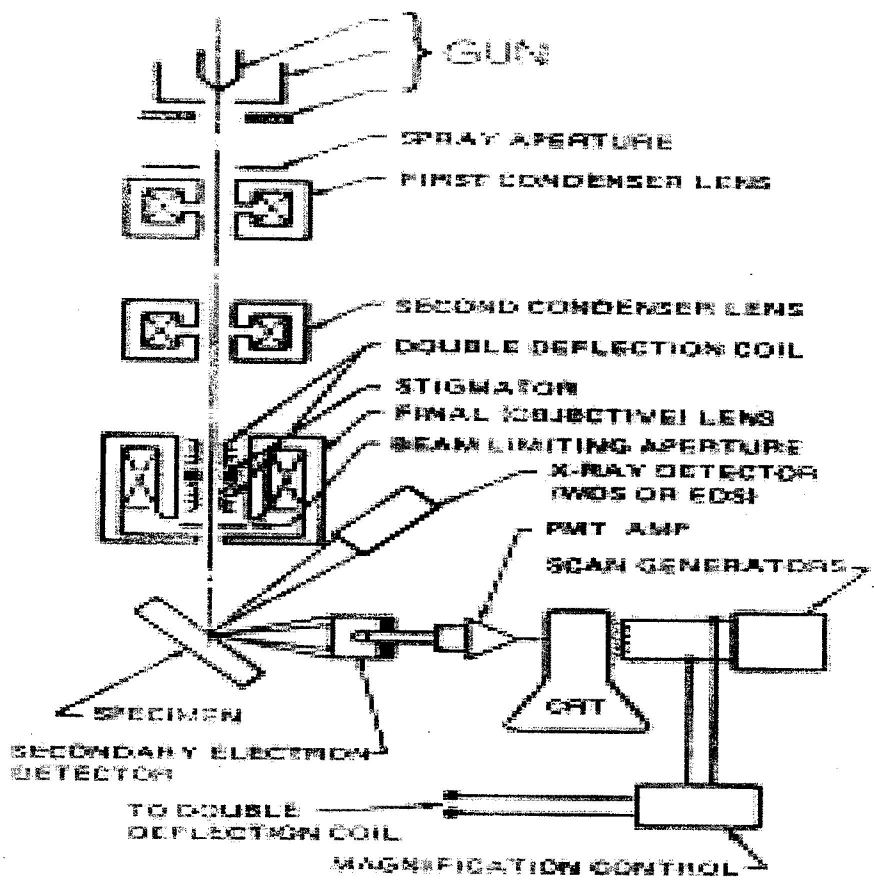


Figure 2.11. Schematic drawing of the electron and x-ray optics of a combined SEM-EPMA.

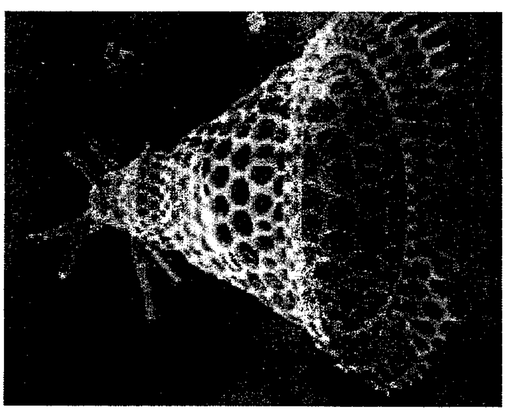
Fig 2.11

Essential components of all SEMs include the following:

- Electron Source ("Gun")
- Electron Lenses
- Sample Stage
- Detectors for all signals of interest
- Display / Data output devices
- Infrastructure Requirements:
    - Power Supply
    - Vacuum System
    - Cooling system
    - Vibration-free floor
    - Room free of ambient magnetic and electric fields

SEMs always have at least one detector (usually a secondary electron detector), and most have additiona detectors. The specific capabilities of a particular instrument are critically dependent on which detectors accommodates.

Applications



The SEM is routinely used to generate high-resolution images of shapes of objects (SEI) and to show spati variations in chemical compositions:

1) acquiring elemental maps or spot chemical analyses using EDS,

2) discrimination of phases based on mean atomic number (commonly related to relative density) using BSI and

3) compositional maps based on differences in trace element "activitors" (typically transition metal and Ra Earth elements) using CL.

The SEM is also widely used to identify phases based on qualitative chemical analysis and/ crystalline structure. Precise measurement of very small features and objects down to 50 nm in size is al accomplished using the SEM. Backescattered electron images (BSE) can be used for rapid discrimination phases in multiphase samples. SEMs equipped with diffracted backscattered electron detectors (EBSD) can l used to examine microfabric and crystallographic orientation in many materials.

Strengths and Limitations of Scanning Electron Microscopy (SEM)

Strengths

There is arguably no other instrument with the breadth of applications in the study of solid materia that compares with the SEM. The SEM is critical in all fields that require characterization of solid materia While this contribution is most concerned with geological applications, it is important to note that the applications are a very small subset of the scientific and industrial applications that exist for th instrumentation. Most SEM's are comparatively easy to operate, with user-friendly "intuitive" interface Many applications require minimal sample preparation. For many applications, data acquisition is rapid (le than 5 minutes/image for SEI, BSE, spot EDS analyses.) Modern SEMs generate data in digital forma which are highly portable.

Limitations

Samples must be solid and they must fit into the microscope chamber. Maximum size in horizont dimensions is usually on the order of 10 cm, vertical dimensions are generally much more limited and rarel exceed 40 mm. For most instruments samples must be stable in a vacuum on the order of 10^{-5} - 10^{-6} tor Samples likely to outgas at low pressures (rocks saturated with hydrocarbons, "wet" samples such as coa organic materials or swelling clays, and samples likely to decrepitate at low pressure) are unsuitable fo examination in conventional SEM's.

However, "low vacuum" and "environmental" SEMs also exist, and many of these types of sampl can be successfully examined in these specialized instruments. EDS detectors on SEM's cannot detect ve light elements (H, He, and Li), and many instruments cannot detect elements with atomic numbers less tha 11 (Na). Most SEMs use a solid state x-ray detector (EDS), and while these detectors are very fast and easy utilize, they have relatively poor energy resolution and sensitivity to elements present in low abundanc when compared to wavelength dispersive x-ray detectors (WDS) on most electron probe microanalyze (EPMA). An electrically conductive coating must be applied to electrically insulating samples for study conventional SEM's, unless the instrument is capable of operation in a low vacuum mode.

User's Guide - Sample Collection and Preparation

Sample preparation can be minimal or elaborate for SEM analysis, depending on the nature of th samples and the data required. Minimal preparation includes acquisition of a sample that will fit into the SE chamber and some accommodation to prevent charge build-up on electrically insulating samples. Mo electrically insulating samples are coated with a thin layer of conducting material, commonly carbon, gold, some other metal or alloy.

The choice of material for conductive coatings depends on the data to be acquired: carbon is mo desirable if elemental analysis is a priority, while metal coatings are most effective for high resolutio electron imaging applications. Alternatively, an electrically insulating sample can be examined without conductive coating in an instrument capable of "low vacuum" operation.

MATERIALS AND METHODOLOGY

CHAPTER 3

3.1 METHODOLOGY

Herbal Extraction from Plant

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Characterization of

-Antimicrobial activity.

Plasma Treatment of Cotton and bamboo

↓

Characterization Of treated fabric

-Tensile property

-Water vapour Permeability

↓

Application of herbal extract on plasma Treated material

↓

Characterization of

-antimicrobial activity

-Effect of plasma treatment on

-wound healing activity.

-compare both the material characteristics.

3.2 APLLICATION OF EXTRACT FROM TULSI POWDER:

Active substances were extracted from the tulasi powder using ethanol-water (1:1) mixture. Thi mixture was arrived at after attempting on various solvents and their mixtures for extraction purpose. Solver extraction technique using soxhlet apparatus was employed for the purpose.

3.3 PROCEDURE ADOPTED FOR HERBAL EXTRACTION:

For every 8g of powder 80ml of ethanol-water mixture was used in the process. Tulsi powder wa taken in the thimble and ethanol-water mixture was adopted to the extraction flask. The complete assembly c the apparatus was kept on a heating mantle and its temperature was adjusted in such a way that the solver siphons over once in every 20 min interval. The extraction was continued for 8 hours. After turning off th heat, the thimble was replaced with a condenser and heating continued till the volume of the solution in th flask was reduced to 20ml.Then the solution in the flask was transferred to a beaker and heating mantle t evaporate the ethanol-water mixture. The residual extract was further converted into powder form by applyin vacuum in vacuum desiccators.

3.4 APPLICATION OF HERBAL EXTRACT

Ethanol extracts of the herbs were directly applied on 100% cotton fabric and bamboo fabric by **pad dry-cure** method.1% of the herbal extract was applied on cotton fabric and bamboo fabric along with 6% citric acid as cross-linking agent by pad-dry-cure method. Padding was carried out in a pneumatic paddin mangle at a pressure of 3 psi to get a pick up of 100% on weight of fabric.

Drying- 80 c for 5 min
Curing- 120 c for 3 min

The samples were dried at ambient temperature without washing. The quantity of herbal extrac present in the fabric after drying was found to be 4.57% owm and 6.66% owm.Then the treate (unwashed)samples were washed using the procedure described in ISO:6330-1984E test method using

3%(v/v) soap solution at 40 c for 30 min using l:m 50:1 repeatedly for four times and dried. Both the treate and washed samples were taken for antibacterial testing.

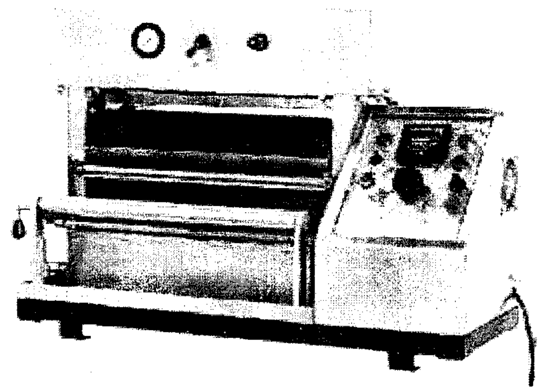

Fig 3.1

3.5 ESTIMATION OF ANTI-MICROBIAL ACTIVITY

Testing for antimicrobial activity of treated and washed samples was carried out using a qualitati method as per the standard AATCC test method 147(Disc diffusion method).Mueller Hinter agar solution w prepared by dissolving Mueller Hinton agar solution(38 g/l) and nutrient broth (13 g/l) in distilled water(10 ml) taken in a conical flask. Then the flask was autoclaved at 121 c for 20 min. Sterilized petri plates we prepared with an equal thickness of Mueller Hinton agar medium. The incubated culture was swabbed on t agar plates using swab stick. Disc shaped treated samples of diameter 1.8 cm were placed on the seeded ag plate. After overnight incubation, the zones of inhibition were measured using the following formula:

Average width of zone of Inhibition, (Z.O.I) = (T-D)/2

Where,

T is the total diameter of the test specimen and clear zone (mm) and
D is the diameter of the test specimen (mm).

3.6 PLASMA TREATMENT

To treat the cotton and bamboo fabrics with plasma. There are different methods of plasma treatment available. In this project, we selected oxygen or air plasma method. Plasma treatment is applied to cotton ar bamboo separately.

Oxygen or air plasma

- Removes organic contaminants by chemical reaction with highly reactive oxygen radicals ar ablation by energetic oxygen ions
- Promotes surface oxidation and hydroxylation (OH groups); increase surface wettability
- Oxidation may be undesirable for some materials (e.g. gold) and can affect surface properties.

PARTICULARS:

Distance=5cm

Time=5 mins

Voltage=500 volt

RESULTS AND DISCUSSIONS

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XXIV/ 2561 /2012 06.02.2012

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Ch.T.R.No.2909

Dear Sir,

This is with reference to your letter dated 30.01.2012 regarding Tulasi powder sample given to us for testing and the results are as follows:

Assessment of Antibacterial Activity as per Kirby Bauer Susceptibility Test

Sample No.	Sample Particulars	Zone of Bacteriostasis (in mm)		
		Staphylococcus aureus **(ATCC 6538)**	***Klebsiella pneumoniae*** **(ATCC 4352)**	**Remarks**
CM5962	Tulasi Powder Sample	15	13	Good Antibacterial Activity

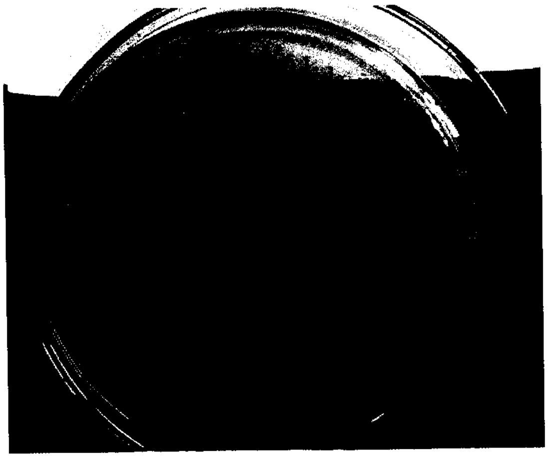
Inoculum size : *S.aureus* :1.5×10^8 cfu/ml, *K.pneumoniae* : 1.5×10^8 cfu/ml

Yours faithfully,

Incharge-Testing(Textile Chemistry)

Encl : Bill

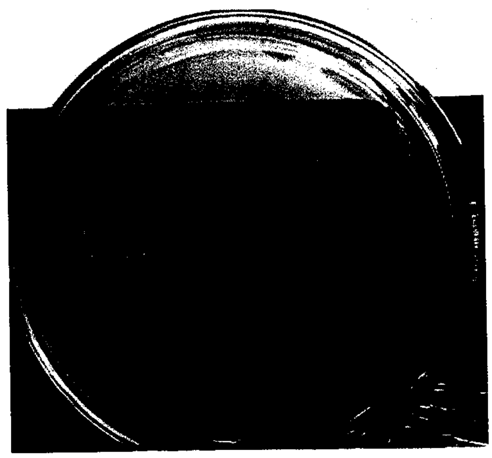
PLASMA TREATED SAMPLE



Cotton Conc. 10

Cotton Conc. 30

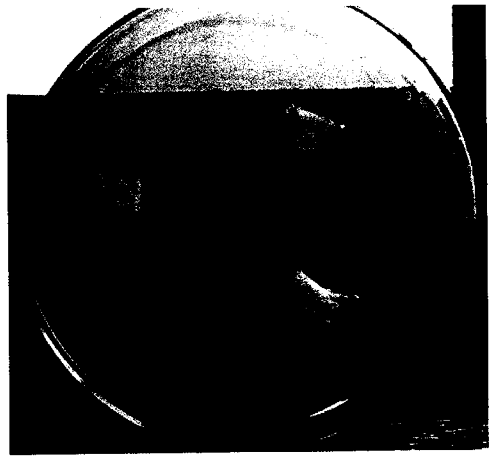
Bamboo Conc. 10



Bamboo Conc. 30

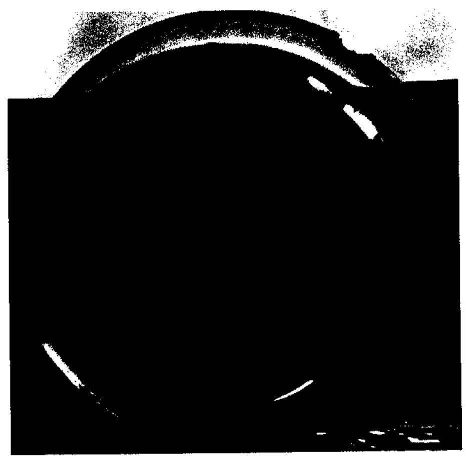
PLASMA UN-TREATED SAMPLE

Cotton Conc. 10



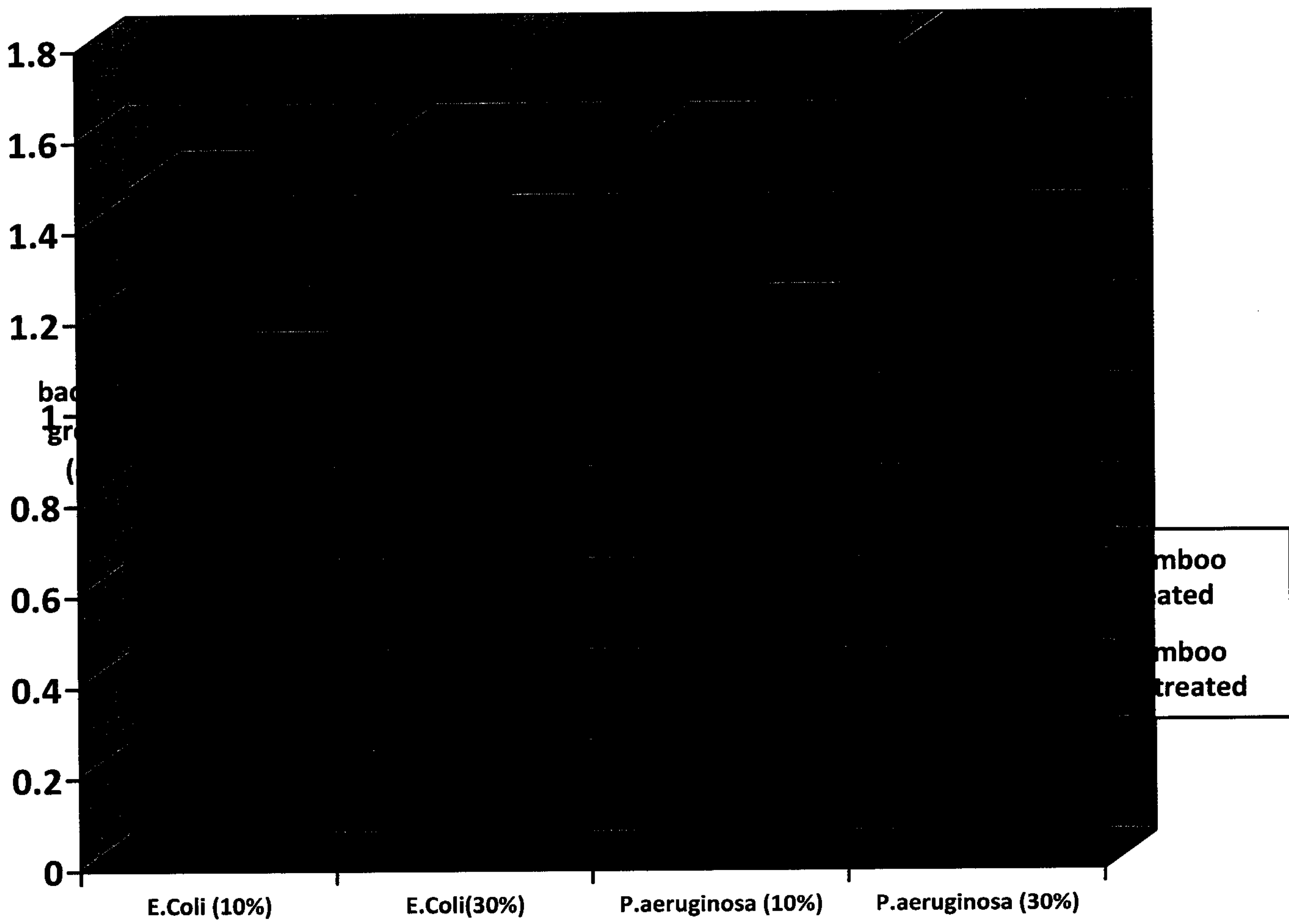
Cotton Conc. 30

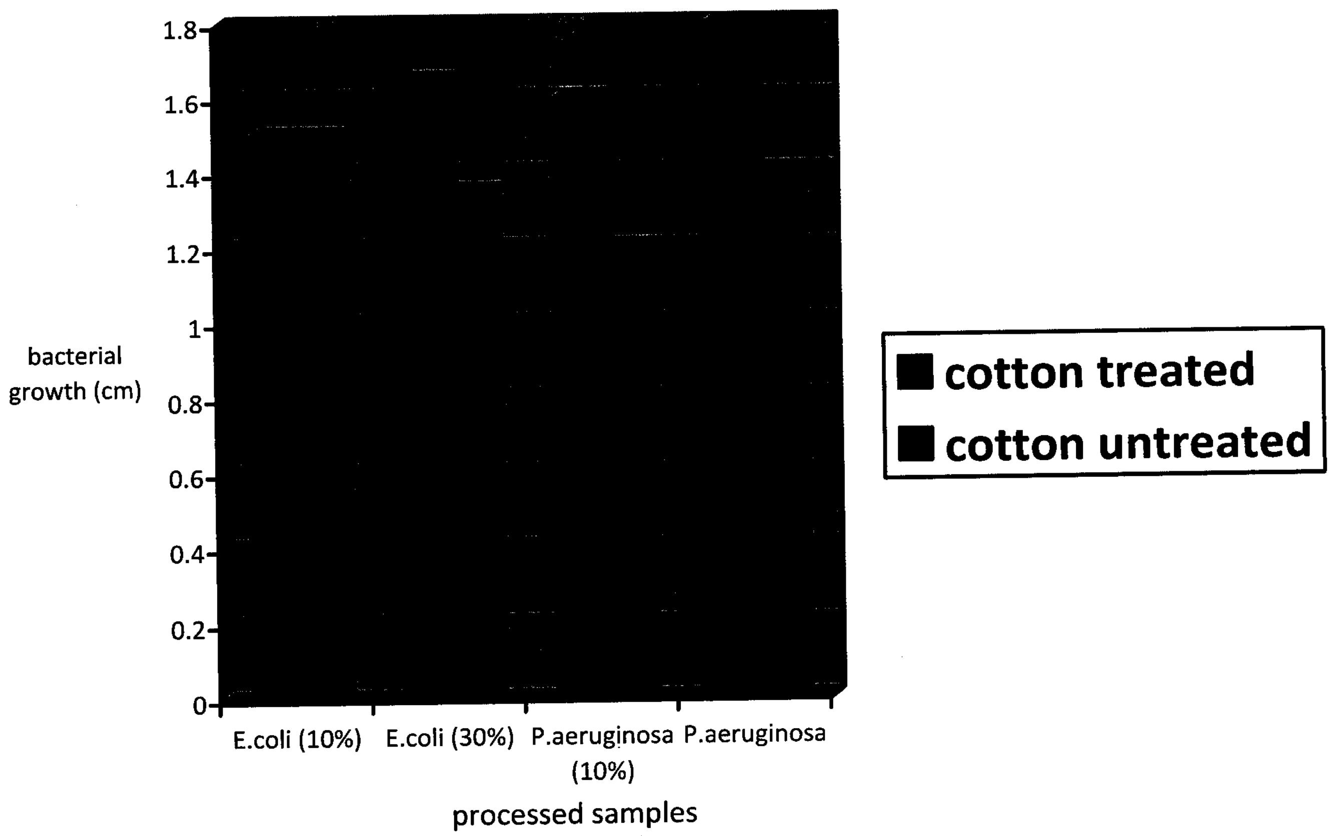
Bamboo Conc. 10



Bamboo Conc. 30

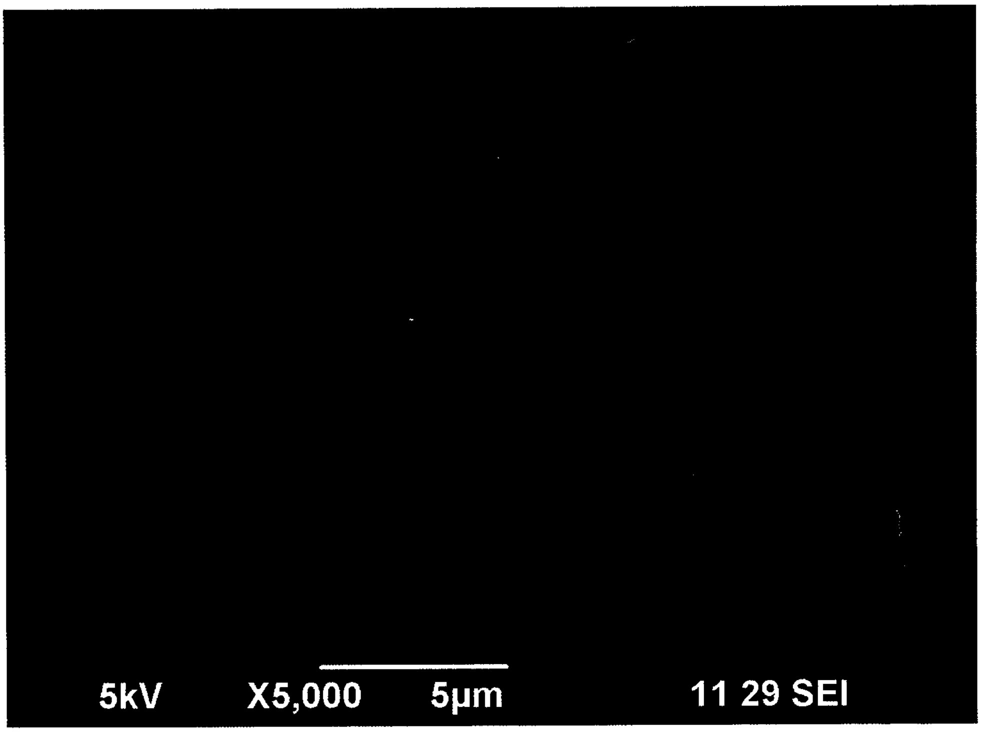
Materials	Concentration (%)	Zone of inhibition in diameter(cm)	
		Microbial strains tested	
		E.Coli	P.aeruginosa
Cotton treated	10	1.5	1.6
	30	1.65	1.8
Cotton untreated	10	1.5	1.2
	30	1.35	1.4
Bamboo treated	10	1.5	1.8
	30	1.6	2.0
Bamboo untreated	10	1.7	1.2
	30	1.5	1.4


1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
E.Coli (10%)
E.Coli(30%)
P.aeruginosa (10%)
P.aeruginosa (30%)

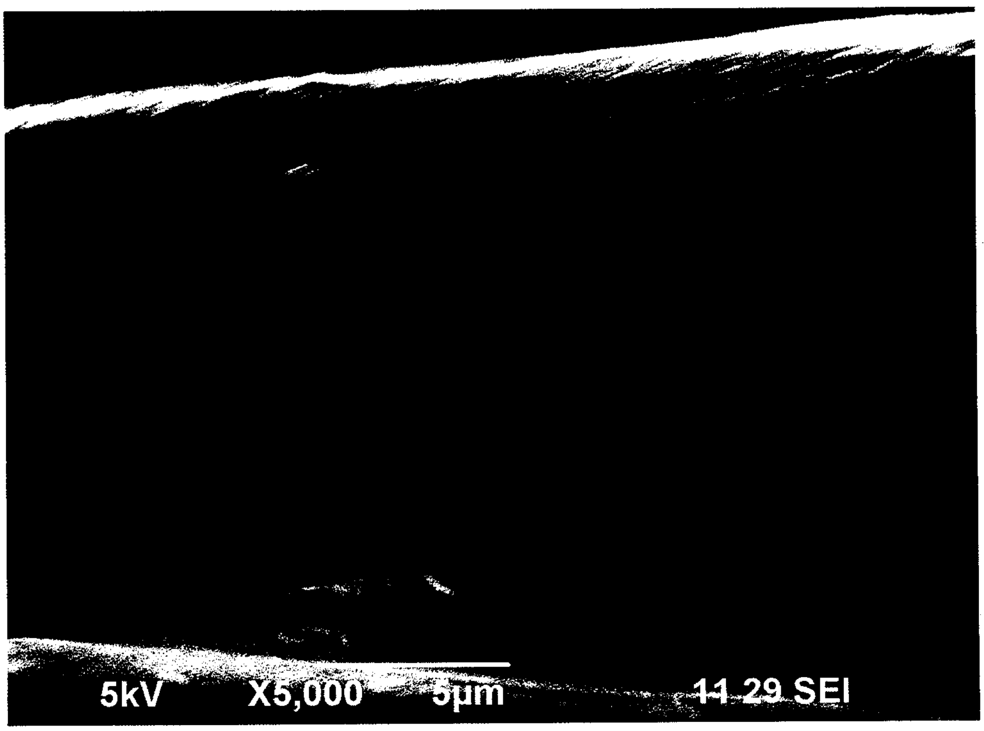

1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
bacterial growth (cm)
E.coli (10%)
E.coli (30%)
P.aeruginosa (10%)
P.aeruginosa
processed samples
cotton treated
cotton untreated

SCANNING ELECTRON MICROSCOPE(SEM)

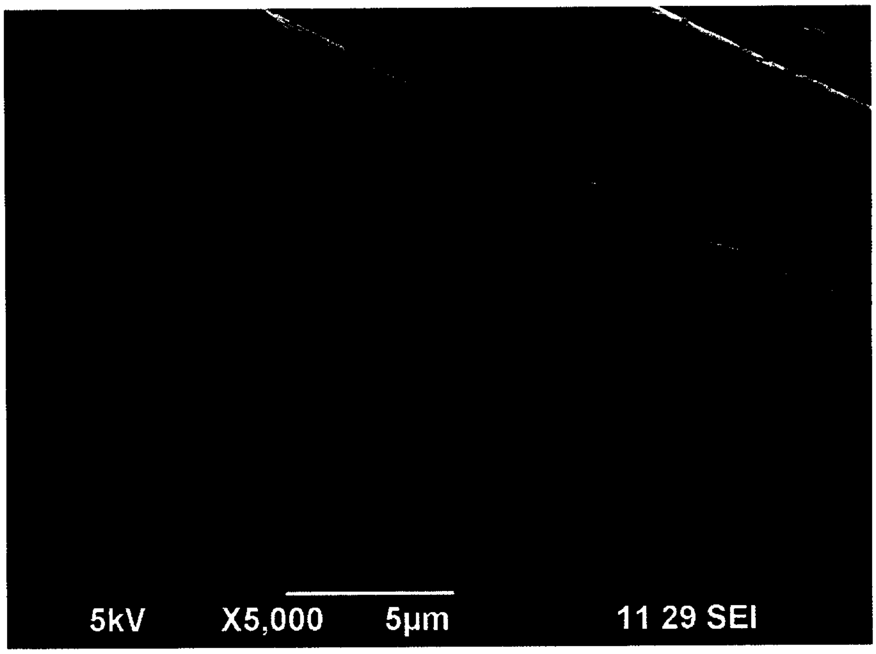
Cotton Treated



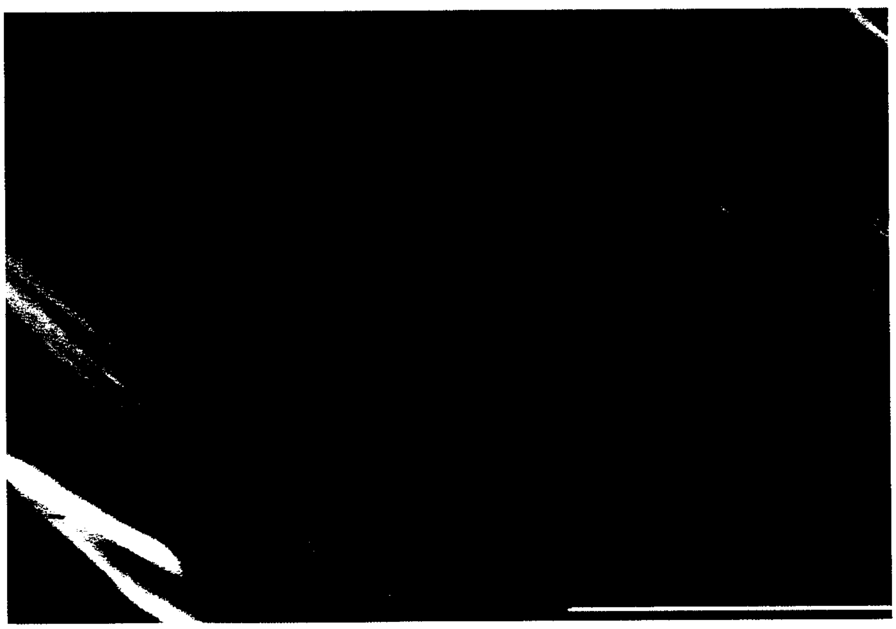
Cotton Untreated



Bamboo Treated



Bamboo untreated



Conclusions

The following conclusions were made from the work done.

1. It is proved that Tulsi has antimicrobial activity in its liquid extract form.
2. Plasma treatment enhanced the antimicrobial activity on both cotton and bamboo fibres.
3. The concentration of the herbal extract played a vital role. The fabric treated with conc.30 ha a good antimicrobial activity.
4. Compared to cotton, bamboo has got higher antimicrobial property.

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