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DEVELOPMENT OF NANO CALCIUM ALGINATE COATED FABRIC FOR MEDICAL APPLICATIONS

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ABSTRACT
Textile material plays an important role in medical textile product. The medical textile products are in the form of woven, non-woven and knitted textile materials which are in elastic ,non-elastic and compressional nature. The alginate is extracted from seaweeds and it has natural anti-bacterial property. In this experimental work, we have to focus on the development of anti-bacterial medical textile product using nano calcium alginate, which is coated on the cotton fabric. The property of the calcium alginate differs when it is in nano form. After coating, the presence of functional groups will be analyzed using FTIR and the size of nano particles will be analyzed using Scanning Electron Microscopy (SEM). The anti-bacterial activity will be analyzed using AGAR test against straphylococcus aureas and E coli. The objective is to analyze that the nano calcium alginate coated fabric give better bacterial resistance and minimize the growth of bacteria. The other properties such as air permeability, water absorbency and stiffness test will be tested.

Keywords: Scanning electron microscopy, anti-bacterial, air permeability, seaweeds, nano particles.

INTRODUCTION

Nano innovation is a quickly developing field on the planet and Nano materials are broadly utilized in the field of electrical, hardware, mechanical, biotechnology and materials. Nano completing is one of the creating regions in material completing for bestowing useful completions tothe material materials, for example, against bacterial action, UV assurance, water repellence, fire resistant, self cleaning, biomedical application, and so on. Nano materials, for example, Nano Tio2, Nano silver, Nano silica and so on, are utilized to significant above properties. Nano silver particles are broadly used to give antibacterial action to the cotton texture. Regular materials, for example, alginate, chitosan and so on, are broadly utilized for the improvement of wound dressing material. The chitosan and alginate materials are extricated from the ocean growth and after a few filtration process, these materials are covered on the outer layer of the texture to confer wound mending property.

Nano calcium alginate covered and uncoated texture essential properties, for example, Tensile. strength, Tearing strength, Air porousness. Scraped spot obstruction, and Stiffness test have been examined exhaustively. Molecule size and Fourier change infrared spectroscopy (FTIR) has been examined.The antibacterial movement of the texture has been dissected. T test is utilized to examine the outcomes. The outcomes show that the properties, for example, Tensile strength, Tearing strength, Air penetrability, Abrasion and Stiffness test show massive contrast between the treated and untreated examples.

The nano calcium alginate covering really safeguards the development of microorganisms on the texture and it recuperates the injury quality.

MATERIALS AND METHODS

3.1 INTRODUCTION

The required raw material such as calcium alginate, 100% cotton fabric and other required materials will be purchased. The physical properties of untreated fabrics will be analyzed

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with standard testing equipments by standard testing methods. The Nano calcium alginate particles will be synthesized by milling technique and the synthesized particles will be characterized by XRD (x-ray diffraction study) to know the amorphous or crystalline nature of the synthesized particles, particle size analyzer will be used to identify the size of the particles. The synthesized Nano calcium alginate particles will be coated on the surface of fabrics by pad-dry-cure method with suitable solvent and binder. SEM(Scanning Electron Microscope) will be used to obtain the image of uncoated and coated fabric surfaces.

The coated fabric properties such as crease recovery angle, whiteness index, tensile strength, tear strength, flexural rigidity, weight loss due to abrasion and air permeability will be tested as per the ASTM standard test methods. The coated fabric will be characterized by FTIR Study (Fourier Transform Infrared Spectroscopy) to confirm the presence of Nano calcium alginate particles. The functional properties such as wound healing and UV protection properties will be analyzed for the coated fabric.

3.2 MATERIALS USED

We bought 10 meters of 100% cotton woven fabric and their construction parameters are as follows
Material used: 100% cotton woven fabric (bleached)
Warp count : 40º : 40"
Weft count : 40
Types of weave: Plain weave
Ends per inch: 40
Picks per inch : 55
Conver Factor 17.618
GSM : 146.4

3.3 CONTING PROCESS

For the application of Nano calcium alginate on 100% cotton woven fabric, there are basically two processes are involved they are

1. Chemical Preparation
2. Pad-dry-cure process

Some of the smples are:

1% calcium alginate coated fabric

3% calcium alginate coated fabric 5% calcium alginate coated fabric

1% Nano calcium alginate coated fabric

3% Nano calcium alginate coated fabric

5% Nano calcium alginate coated fabric

1.3.1. Chemical Preparation :

M:L:R =1:5

Acrylic binder = 1%

Wetting Agent = 0.1%

Silicon Softener = 1%

Sodium Carbonate = 1%

3.3.2. Pad-Dry-Cure Method

The next step is pad-dry-cure- process: Here the fabrics are dipped into calcium and Nano calium alginate solution. Depending on the six samples prepared in various concentrations the fabric is dipped in that solution for 5minutes. After dipping the fabric in the solution for 5 minutes, it is pad using padding mangle. The expression percentage of the fabric should be. 100. the fabric is then dried at the ternperature of 180 C for 5 minutes. The fabric is then cured at respective for 2 minutes.

3.4. EVALUATION OF COATED FABRIC

The samples thus prepared are tested for various properties. The various tests that are done are.

3.4.1. Antibiotic Sensitivity Test:

The calcium alginate and Nano calcium alginate coated fabrics is analyzed by

• Kirby Bauer Method

• Anti Bacterial Activity Method

3.4.2. Air Permeability

The air permeability was measured using an air permeability testing apparatus in accordance

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with the test procedures as directed in ASTM test method D737.

3.4.3. Abrasion Resistanc:

The resistance to abrasion of all the cloths of cotton, synthetic and blended could be found out using martindale abrasion tester. The design of the instrument makes the use of principles of two simple harmonic motion working at night angles. Theinstrument can be used for getting circulat or linear motion. The test is used for both woven and knitted fabric with little modification.

3.4.4 Tear Strength

Tearing strength is measured before and after coating. The instrument used is Elemandorf tear strength tester. Warp way and weft way tear strength is measured with the following formula.

Mean tearing strength in g-k mean value of scale reading.

Where K= 64

3.4.5. Tensile Strength

The tensile strength of the fabric was measured using a tensile strength tester in accordance with the test procedures as directed in ASTM test method samples are compared with the untreated simple and the best combinat 27/48 ik fabric is found out.

3.5. ANTIBIOTIC SENSITIVITY TEST

3.5.1. Kirby Bauer Method

Materials Required

Cultures: Staphylococcus spp. Pseudomonas app, Streptococcus spp, and proeus valgaris app

Medium: Mueller Hinton agar plates, Peptone water.

Equipements: Calcium alginate coated fabric, sterile loop, Forceps, Sterile Cotton swabs, Bunsen burner, Millimeter ruler and Marker pen, incubator, etc.,

3.5.2. Preparation of Antibiotics Dics

1. Punch filter paper discs of 6 mm in diameter using a stationary punch.

2. Separate the discs and put in a penicillin bottle. Each bottle should contaion 120 discs because it has been standardized that 0.5 ml of antibiotic working solutions when added completely absorbs it.

3. Sterilize the cotton plugged penicillin bottles with the discs by autoclaving it at 121 C for 15 minutes/15 ibs pressure.

4. Dry the sterilized discs at 80 C for 20 minutes. Replace the cotton plugs of the penicillin bottles with sterile rubber caps.

35.3. Preparation of Muller - Hinton Agar

1. Following manufacture's instructions, dissolve the dehydrated media in distilled water and autoclave the bulk media at 15 lbs pressure for 15 minutes (121 C)

2. Dispense the bulk in sterile Petri dishes kept on a flat surface. The Depth of the medium should be 4 mm (25 ml for an 8.5 cm Petri dish).

3. Store the poured plates at 4C.

3.5.4. Procedure

a) Preparation Of Inoculums

Transfer four morphologically similar colonies of the organis to be tested with a sterile loop and inoculate it into 5 ml of peptone water.
Incubate at 37° C for 3-4 hours.
The turbidity of this suspension should match visually with Mac Farland tube 0.5 units. If the density is more, it is to be diluted with sterile saline.
The comparison can be made against a white back ground with a contrasting black line.

b). Inoculation
dip a sterile cotton swab into the broth suspension, twist and remove the excess of fluid by pressing the swab on the walls of the tube above the broth level
Streak the bacteria charged swab evenly on the surface of the dried Muller Hinton agar. Streaked it in three directions by rotating the plate 60° after each streak.

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C) Application Of Disc

After allowing the plate to dry(usually less than 15 minutes) apply the sterile chemical coated discs on the surface of the medium with a sterile forceps.

Press the dise gently to make even contact with the surface.

8.5cm Petri disc can accommodate six discs.

d) Incubation

1. Incubate the plates at 37° C for 16-18 hours.

Observation and Interpretation

1. Measure the diameter of the zone of inhibition of growth using millimeter scale or verniar calipers.

2. The results are tabulated.

15.5. Preparation of Mac Farland standard

1. Add 0.5 ml of 0.048 M BaCl2 (1.75% w/v BaCl2. 2H20) to 99.5 ml of 0.18 MH_2SO4(1% w/v) the standard should be kept in screw capped tubes of the same size as that used for broth culture.

2. Store in dark at room temperature and replace at least once in six months.

3. Before use, the standard should be shaken vigorously. A vortex mixture will help in uniform mixing.

Fig. 6. The Entire Surface of a Plate of Nutrient Medium is Swabbed with Organism to Be Tested

Fig. 7. Handle of Dispenser Is Pushed Down To Place 12 Disks on the Medium In Addition To dispensing Disks; This Dispenser Also Tamps Disks on to Medium

Fig.8. Cartridges (difco) can be used to dispense individual disks. Only 4 or 5 disks should be placed on small (100mm) plates

.

Fig 9. After 18 Hours Incubation, The Zones of Inhibition (Diameters) Are Measured In Millimeters Significance of Zones Is Determined From Kirby- Bauer Chart The Different Steps In Carrying Out Antibiotic susceptibility Testing

3.6. FOURIER TRANSFORM INFRARED SPECTOSCOPY (FTIR) Fourier

Fourier Transform Infrared Spectroscopy (FTIR) gives explicit data about compound holding and atomic designs, making it helpful for dissecting natural materials and inorganic materials. Compound securities vibrate at trademark frequencies, and when presented to infrared radiation, they ingest the radiation at frequencies that match their vibration modes. Estimating the radiation ingestion as an element of recurrence creates a range that can be utilized to distinguish utilitarian gatherings and mixtures.

FTIR investigation is a disappointment examination method that gives data about the synthetic holding or sub-atomic design of materials, whether natural or inorganic. It is utilized in disappointment examination to distinguish obscure materials present in example, and is generally directed to supplement EDX investigation.

The procedure chips away at the way that securities and gatherings of securities vibrate at trademark frequencies. A particle that is presented to infrared beams retains infrared energy at frequencies which are trademark to that particle. During FTIR examination, a spot on the example is exposed to a tweaked IR bar. The example's conveyance and reflectance of the infrared beams at various frequencies is converted into an IR retention plot comprising of opposite tops. The subsequent FTIR unearthly example is then examined and coordinated with known marks of indentified materials in the FTIR library.

Fig. 10FTIR Spectrometer from Perkin Elmer

3.6.1. Ideal Uses for FTIR Analysis
Identifying the molecular structure of organic compounds for contamination analysis

Identification of organic particles, powders, film,and liquids (material identification)

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Quantification of O and H in Si, and H in SiN wafers (Si-H vs N-H)

Contamination analysis (extracts, out gassed products, residues)

3.6.2. Applications

Aerospace
Automotive
Biomedical/biotechnology
Compound Semiconductor
Data Storage
Displays
Electronics
Industrial products
Lighting
Pharmaceutical
Photonics
Polymer
Semiconductor
Solar photovoltaic's
Telecommunications

3.6.3. Strengths of FTIR Analysis

Capable of indentifying organic functional groups and often specific organic compounds
Extensive spectral libraries for compound indentification
Ambient conditions (not vacuum; good for volatile compounds)
Typically non-destructive
Minimum analysis area:- 15 micron

3.6.4. Limitations of FTIR Analysis
Limited surface sensitivity(typical sampling volumes are - 0.8µm
Minimum analysis area: - 15 micron
Limited inorganic information
Typically not quantitative (needs standards)

3.6.5. Process Details

Signal Detected : Infrared absorption
Elements Detected : Molecular g
Detection Limit : 0.1-1Wt%
Depth Resolution : 0.1-2.5µm

3.7. PRATICLE SIZE ANALYZER

3.7.1. Particles in the Nanometer Range Offer Numerous New Properties

Scratchproof surfaces and coatings.
Conductive glass.
Non corrosive steel.
Optical storage capacity of plastics. \
Bullet proof synthetic fibres.

3.7.2. Technical Parmeters

Measuring range: Inm-10.000 nm
Principle: Dynamic light scattering
Calculation: dynamic light scattering
Calculation: 3 D cross correlation technique
Application: Emulsions, suspensions
Scattering angle: 9- degree
Make: SYMPATEC
Germany Model: NANOPHOX
Analysis volume: ca. 0.3 ml
Sample container: Cuvette 10xq0mm²
Cuvette Position: Automatic or manual

Light Source: HeNe-laser
Wave length: 632.8nm
Temperature range: 15- 40°C

3.7.3. The Principle of Photon Cross Correlation Spectrosecopy (PCCS) With Nanophox

Two laser beams cross over in the sample container and generate two similar signal patterns (speckles). Identical parts can be selected by correlation of the intensities of two equivalent signal spots

3.7.4. The Principle Diagram of Photon Cross Correlation Spectroscopy (PCCS) With Nanophox

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So the calcium and Nano calium alginate coating and cross linking treatment affect the tearing strength of the fabric. The Nano calcium alginate all samples shows higher teraing strength values among all the samples and is show in figure.

The t-test result shows that there is no significant difference between calcium and nano calcium alginate samples regarding tearing strength test.

RESULTS AND DISCUSSION

4.1 TENSILE STRENGTH

TABLE 4.1.1 Analysis of Tensile Strength

S.no	Types of Fabrics	SAMPLE 1	SAMPLE 2	SAMPLE 3
1	Untreated Fabric	65	63	68
2	1% Ca Coated Fabric	50	54	52
3	3% Ca Coated Fabric	52	56	56
4	5% Ca Coated Fabric	58	56	55
5	1% NCa Coated Fabric	50	51	50
6	3% NCa Coated Fabric	60	59	60
7	5% NCa Coated Fabric	58	61	60

Here,
Ca 1% = 1% Calcium Alginate Coated Fabric
Ca 3% = 3% Calcium Alginate Coated Fabric
Ca 5% = 5% Calcium Alginate Coated Fabric
NCa 1% = 1% Nano Calcium Alginate Coated Fabric
NCa 3% = 3% Nano Calcium Alginate Coated Fabric
NCa 5% = 5% Nano Calcium Alginate Coated Fabric

Table 4.1.2 Summary of Analysis of Variance

Groups	Count	Sum	Average	Variance
Column 1	7	393	56.14286	32.14286
Column 2	7	400	57.14286	17.14286
Column 3	7	401	57.28571	36.2381

Table 4.1.3 Analysis of Variance (ANOVA)

Source of Variation	SS	DF	MS	F cal	P-Value	F-Table
Between Groups	5.428571	2	2.714286	0.095212	0.909635	3.554557
Within Groups	513.1429	18	28.50794	-	-	-
Total	518.5714	20	-	-	-	-

4.1.4 T-Test

	Variable 1	Variable 2

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Mean	59.89	56.4
Variance	37.3863	30.72
Observation	3	3
Person Correlation	-0.677021226	-
Hypothesised Mean Difference	0	-
Df	2	-
T Stat	0.566166914	-
P(T<=t) one-tail	0.31416843	-
t Critical one-tail	2.91998558	-
P(T<=t) two-tail	0.62833686	-
t Critical two-tail	4.30265273	-

T calculated = 0.566
T Table = 4.302 at 95% confidence level

Tensile Strength tests of all samples were critically analysed by analysis of variance (ANOVA - single factor). The f calculated is greater than the tabulated value and is shown in the table 4.1.3. From the table it is concluded that there is no significant difference between the samples. So the calcium and Nano calcium alginate coating affects the fabric tensile strength. The nano calcium alginate 3% and 5% samples show higher stiffness values among all samples and are shown in fig. The t-test results show that there is no significant difference between untreated and calcium and nano calcium alginate samples regarding stiffness test.

4.2 TEARING STRENGTH

Table 4.2.1 Analysis of Tearing Strength

S.no	Types of Fabrics	WARP	WEFT
1	Untreated Fabric	30	32
2	1% Ca Coated Fabric	28.66	29
3	3% Ca Coated Fabric	28.66	30
4	5% Ca Coated Fabric	30	29
5	1% NCa Coated Fabric	29.33	34.66
6	3% NCa Coated Fabric	31.33	32
7	5% NCa Coated Fabric	32	32

Here,
Ca 1% = 1% Calcium Alginate Coated Fabric
Ca 3% = 3% Calcium Alginate Coated Fabric
Ca 5% = 5% Calcium Alginate Coated Fabric
NCa 1% = 1% Nano Calcium Alginate Coated Fabric
NCa 3% = 3% Nano Calcium Alginate Coated Fabric
NCa 5% = 5% Nano Calcium Alginate Coated Fabric

Table 4.2.2 Summary of Analysis of Variance

Groups	Count	Sum	Average	Variance
Column 1	7	209.98	29.99714	1.634824
Column 2	7	218.66	31.23714	4.16699

Table 4.2.3 Analysis of Variance (ANOVA)

Source of Variation	SS	DF	MS	F cal	P-Value	F-Table

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Between Groups	5.3816	1	5.3816	1.855144	0.198207	4.747225
Within Groups	34.81089	12	2.900907	-	-	-
Total	40.19249	13	-	-	-	-

Table 4.2.4 T-Test

	Variable 1	Variable 2
Mean	29.665	31.5475
Variance	0.872966667	1.191375
Observation	4	4
Person Correlation	-0.863241472	-
Hypothesised Mean Difference	0	-
Df	3	-
T Stat	-1.925071637	-
P(T<=t) one-tail	0.074944659	-
t Critical one-tail	2.353363435	-
P(T<=t) two-tail	0.149889319	-
t Critical two-tail	3.182446305	-

T Calculated = 1.925

T Table = 3.182 at 95% confident level

Tearing strength of all samples was critically analysed of variance (ANOVA)- Single Factor. The f calculated is greater than tabulated value and is shown in the table. From the table it is concluded that there is no significant difference between the samples. So the calcium and the nano calcium coating and cross linking treatment affect the tearing strength of the fabric. The nano calcium alginate samples shows higher shows higher tearing strength values among all the samples and is shown in the figure.

The t-test results shows that there is no significant difference between calcium and nano calcium alginate samples regarding tearing strength test.

S.no	Types of Fabrics	Sample WT	0-25	50-75	75-100
1	Untreated Fabric	0.185	0.176	0.176	0.174
2	1% Ca Coated Fabric	0.183	0.179	0.177	0.178
3	3% Ca Coated Fabric	0.186	0.184	0.183	0.184
4	5% Ca Coated Fabric	0.19	0.188	0.187	0.184
5	1% NCa Coated Fabric	0.179	1.177	0.175	0.172
6	3% NCa Coated Fabric	0.172	0.171	0.169	0.166
7	5% NCa Coated Fabric	0.176	0.176	0.175	0.171

Here,
Ca 1% = 1% Calcium Alginate Coated Fabric
Ca 3% = 3% Calcium Alginate Coated Fabric

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Ca 5% = 5% Calcium Alginate Coated Fabric
NCa 1% = 1% Nano Calcium Alginate Coated Fabric
NCa 3% = 3% Nano Calcium Alginate Coated Fabric
NCa 5% = 5% Nano Calcium Alginate Coated Fabric

Table 4.3.2 Summary of Analysis of Variance

Groups	Count	Sum	Average	Variance
Column 1	7	1.285	0.179714	3.12E-05
Column 2	7	1.247	0.178143	3.45E-05
Column 3	7	1.234	1.76286	3.06E-05
Column 4	7	1.225	0.175	3.7E-05

Table 4.3.3 Analysis of Variance (ANOVA)

Source of Variation	SS	DF	MS	F cal	P-Value	F-Table
Between Groups	9E-05	3	0.0003	0.900322	0.455487	3.008787
Within Groups	0.00079971	24	3.33E-05	-	-	-
Total	0.00088971	27	-	-	-	-

Table 4.3.4 T-Test

	Variable 1	Variable 2
Mean	29.665	31.5475
Variance	0.872967	0.409708
Observation	4	4
Person Correlation	-0.72795	-
Hypothesised Mean Difference	0	-
Df	3	-
T Stat	-2.90643	-
P(T<=t) one-tail	0.031088	-
t Critical one-tail	2.353363	-
P(T<=t) two-tail	0.06217	-
t Critical two-tail	3.182446	-

T Calculated = 2.906

T Table = 3.182 at 95% confident level

Abrasion test of all samples were critically analysed by variance (ANOV Single Factor). The f calculated is greater than the f tabulated value and is shown in the table. From the table it is concluded that there is no significant difference between the samples. So the calcium and nano calcium alginate coated fabrics affects the fabric abrasion test values. The calcium alginate all samples shows higher abrasion values among all the samples and are shown in the figure. The t-test results shows that there is no significant difference between calcium and nano calcium alginate samples regarding Abrasion test.

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4.4 Stiffness Test

Table 4.4.1 Analysis of Stiffness Test

S.no	Types of Fabrics	WARP	WEFT
1	Untreated Fabric	5.5	4.91
2	1% Ca Coated Fabric	4.975	4.265
3	3% Ca Coated Fabric	5.5	5.2
4	5% Ca Coated Fabric	5.3	5.01
5	1% NCa Coated Fabric	5.45	5.45
6	3% NCa Coated Fabric	5.45	5.45
7	5% NCa Coated Fabric	5.5	5.55

Here,
Ca 1% = 1% Calcium Alginate Coated Fabric
Ca 3% = 3% Calcium Alginate Coated Fabric
Ca 5% = 5% Calcium Alginate Coated Fabric
NCa 1% = 1% Nano Calcium Alginate Coated Fabric
NCa 3% = 3% Nano Calcium Alginate Coated Fabric
NCa 5% = 5% Nano Calcium Alginate Coated Fabric

Table 4.4.2 Summary of Analysis of Variance

Groups	Count	Sum	Average	Variance
Column 1	7	37.495	5.356429	0.066289
Column 2	7	35.865	5.123571	0.190973

Table 4.3.3 Analysis of Variance (ANOVA)

Source of Variation	SS	DF	MS	F cal	P-Value	F-Table
Between Groups	0.189779	1	0.189779	1.475373	0.247861	4.747225
Within Groups	1.543571	12	0.128631	-	-	-
Total	1.73335	13	-	-	-	-

Table 4.4.4 T-Test

	Variable 1	Variable 2
Mean	5.06425	5.4075
Variance	0.126629	0.019475
Observation	4	4

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Hypothesised Mean Difference	0	-
Df	4	-
T Stat	-1.79601	-
P(T<=t) one-tail	0.0737459	-
t Critical one-tail	2.131847	-
P(T<=t) two-tail	0.146918	-
t Critical two-tail	2.776445	-

T Calculated = 1.796
T Table = 2/77 at 95% confident level

Stiffness tests of all samples were critically analysed by variance (ANOV Single factor). The f calculated is greater than the f tabulated value as shown in the table. From the table it is concluded that there is no significant difference between the samples. So the calcium and nano calcium alginate coating affects the fabric stiffness test values. The calcium alginate samples show higher abrasion values among all the samples and are shown in the figure. The t-test results show that there is no significant difference between calcium and nano calcium alginate samples regarding Stiffness test.

4.5 Air Permeability Test

TABLE 4.5.1 Analysis of Tensile Strength

S.no	Types of Fabrics	SAMPLE 1	SAMPLE 2	SAMPLE 3
1	Untreated Fabric	83.88	82.94	83.66
2	1% Ca Coated Fabric	77.29	78	78.36
3	3% Ca Coated Fabric	75.22	72.92	74.28
4	5% Ca Coated Fabric	72.22	73.11	72.92
5	1% NCa Coated Fabric	81.77	82.66	82
6	3% NCa Coated Fabric	80.43	80.2	80.4
7	5% NCa Coated Fabric	80.72	80.72	80.66

Here,
Ca 1% = 1% Calcium Alginate Coated Fabric
Ca 3% = 3% Calcium Alginate Coated Fabric
Ca 5% = 5% Calcium Alginate Coated Fabric
NCa 1% = 1% Nano Calcium Alginate Coated Fabric
NCa 3% = 3% Nano Calcium Alginate Coated Fabric
NCa 5% = 5% Nano Calcium Alginate Coated Fabric
Table 4.4.2 Summary of Analysis of Variance

Groups	Count	Sum	Average	Variance
Column 1	7	551.53	78.79	16.56047
Column 2	7	551.55	78.79286	15.75262
Column 3	7	552.28	78.86714	15.83526

Table 4.4.3 Analysis of Variance (ANOVA)

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Source of Variation	SS	DF	MS	F cal	P-Value	F-Table
Between Groups	0.052181	1	0.02609	0.001626	0.998376	3.554557
Within Groups	1.543571	12	0.186312	-	-	-
Total	1.73335	13	-	-	-	-

Take 4.5.4 T.Test

	Variable 1	Variable 2
Mean	79.83	77.93
Variance	6.6852	21.7633
Observation	3	3
Person Correlation	-0.999982838	-
Hypothesised Mean Difference	0	-
Df	2	-
T Stat	0.4523875317	-
P(T<=t) one-tail	0.347206971	-
t Critical one-tail	2.91998558	-
P(T<=t) two-tail	0694413942	-
t Critical two-tail	2.776445	-

T Calculated 0.453

= 4.302 at 95% confident level

T Table

Air Permeability test of all samples were critically analyzed by variance (ANOV Single factor). The f calculated is greater than f tabulated value and is shown in table. From the table it is concluded that there is no significant difference between the samples. So the calcium alginate coating affects the fabric air permeability. The nano Calcium all samples shows. Higher air permeability test values among all the samples and are shown is figue. The Hest results shows that there is no significant difference between untreated and calcium and Nano calcium alginate samples samples regarding stiffness test.

4.6. PARTICLE SIZE ANALYSIS WINDOX5:

NANOPHOX (0143 P), Cross correlation for Calcium Aliginate

Xu-787.08nm Xso-1114.99nm X10= 1615.06nm SMD=<E16>nm

VMD=<E16>nm X-844.86nm Xg4=1493.09nm X99-2056.27nm ss5 Sv=5.54m²/cm³

4.6.1. Process parameters:

Product Calcium Alginate

Refraction: 1.33-0.001

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Dissloving agent: Sodium Carbonac

Refraction: 1.33, Viscosity,: 0.52mPas

Measuring Cond: 100/15/1/50/27.....

Duration: 50.46s

Temperature: 28.26C

Laser Power: 10.00%

Evaluation: 10.00% Rule: 1.10000nm: 256(log) 0.0012.5ms-1% Mode :NNLS

Measurd Correlation Function;

Amplitude: 3.11% Mean Count Rate Ch: 1.23838kcps

Single Scattering Ration: 15.38%

4.7.1: Kirby Bauer Method:

The antimicrobial activity of nano calcium alginate coated fabrics were tested against ssaphylococcus spp, Pseudomonas app, Streptococcus spp, And Proeus Valgars. the results were tabulated in table 4.8.2

TABLE 4.7.2 ANTHIBIOTIC SENSITIVITY TEST RESULTS

(++) Inhibtion zone present.(-) No inhibiton zone present

The pseudonmonas app showed antibacterial activity against 5% and 3% coated nano calcium alginate.

The staphylococcus spp showed antibacterial activity against 5% coated calcium alginate

The streptococcus spp showed antibacterial activity against 5% coated nano calcium alginate.

The streptococcus spp showed no antibacterial activity against cacicum alginate and nano calium alginate coated fabric.

4.8. Anti Bacterial Activity In Calcium And Nano Calcium Alginate Cocated Fabric:

The calcium alginate and nano calclum alginate coated checked for microbial sterility. The sterility test was checked with nutrient agar medium. The nutrient agar medium is a common medium for cultivation of microorganisms. The nano calcium alginate coated fabrics more sterile than the calcium alginate coated fabris. Its showed the nano calcium alginate coated fabrics control the microbial growth

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CONCLUSION

The calcium and Nano calcium alginate solution was applied on the fabric and the properties such as tearing strength, abrasion resistance, tensile strength test antibiotic sensitivity test, were analyzed. The Nano calcium alginate coated fabric gradually increases the air permeability, but difference between the treated and untreated samples is significant.

Tensile strength, air permeability, shows insignificant result for the Nano calcium alginate coating process. The anti bacterial activity of the fabric is improved by coating the Nano calcium alginate on a fabric.The rate of increase of coating Nano calcium alginate drastically reduces the growth of bacterial on the fabric. Form this work, it is concluded that the physical properties of fabric is not much affected by the Nano silver and is significantly the antibacterial lof the fabric.

REFERENCES

1. Gilchrist T, Martin AM, Wound treatment with Sorbsan an alginate dressing;Biomaterials 1983Oct;4(4):317-320 Motta GJ., Calcium alginate topical dressings : a new dimension in the cost effective

2. treatment for exudating dermal wounds and source Ostomy Wound Manage 1989:25:52-56

3. Doyle JW, roth TP, Smith RM, et al; Effect of calcium alginate on cellular wound healing process modeled in Vitro. J Biomed mater Res 1996 Dec;32(4):561-568 Torres de Castro OG, Galindo Carlos A, Torra I Bou JE., pure calcium- sodium

4.alginate dressing. Multicenter evaluation of chonic cutaneous lesions, Rev enferm 1997Sep;20(229):23-30

5. Barry DP, Bale S, Harding KG., dressing for the treating cavity Wounds;J Wound care 1996 Jan;5(1):10-17

6.Odell EW, Oades p, Lombardi TSymyomatic foreign body reaction to haemostatic alginate; Br J Oral Maxillo face Surg 1994 June;32(3): 178-179

7. Agren MS., four alginate dressing in the treatment of partial thickness wounds: a comparative experimental study; Br J plast Surg 1996 Mar;49 (2):129-134

8. Hendrerson NJ, Crawford PJ, Reeves BC., A randomized trial of calcium alginate swabs to control blood loss in 3-5 years old children. Br Dent J 1998 Feb 28;184(4):187-190.

9.Segal HC ,Hunt BJ, Guilding K., The effects of alginate and non-alginate wound dressing on blood coagulation and platelet activation. J Biomater APPI 1998Jan;12(3):249-257

10. Hartley C, Ng KL, JacksonA., CT and MR appearance of oyolaryngologic packing materials; AJNR Am J Neuroradiol 1995 Sep;16(8):1697-1702

11. Gilchrist T, Martin AM, Wound treatment with Sorbsan -an alginate dressing;Biomaterials 1983Oct;4(4):317-320

12. Motta GJ., Calcium alginate topical dressings : a new dimension in the cost effective treatment for exudating dermal wounds and source ;Ostomy Wound Manage 1989:25:52-56

13. Doyle JW, roth TP, Smith RM., et al; Effect of calcium alginate on cellular wound healing process modeled in Vitro. J Biomed mater Res 1996 Dec;32(4):561-568

14. Hartley C, Ng KL, JacksonA., CT and MR appearance of oyolaryngologic packing materials; AJNR Am J Neuroradiol 1995 Sep;16(8):1697-1702

15. Torres de Castro OG, Galindo Carlos A, Torra I Bou JE., pure calcium- sodium alginate dressing. Multicenter evaluation of chonic cutaneous lesions, Rev enferm 1997Sep;20(229):23-30