DESIGN & DEVELOPMENT OF SURGICAL GOWNS TO ENHANCE ITS PERFORMANCE

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SUMMARY

Surgical gowns are examples of personal protective equipment used in health care settings. They are used to protect the wearer from the spread of infection or illness if the wearer comes in contact with potentially infectious liquid and solid material. This has become more important with the growing risk of HIV and other viruses. They may also be used to help prevent the gown wearer from contaminating vulnerable patients, such as those with weakened immune systems. Non-woven gowns are generally produced for single use and categorized as disposable type, whereas woven gowns are reusable.

In the last few years, health care professionals have been faced with an increasing number of patients suffering from serious diseases, which are spread through microorganisms like Pseudomonas Aeruginosa, E. coli, Acinetobacter, Baumanni, Klebsiella Pneumoniae etc. Awareness and attitude of the consumers towards hygiene and active lifestyle has created a good deal of developments in medical textiles, which has also increased the potential of research and development in this field.

Gowns are one part of an infection-control strategy. However, with this protection, health care garments must also be comfortable and not restrict movement. Further it also needs to make the decision whether it is better to disinfect the used garment for its reuse or dispose it completely after each use.

Different hospitals have been visited to take stock of the knowledge about the different types of surgical gowns in use, their cleaning process and their life span etc. It was observed that only in few cases disposable surgical gowns have been used while reusable cotton surgical gowns are preferred in majority of surgical procedures. The sample fabric of surgical gowns has been collected for some preliminary tests to understand the comfort and safety aspects. It was observed that the fabrics or gowns are not water repellent and have very poor antimicrobial properties. Such surgical gowns may create serious problems for the hospital personnel and patient, as they may acquire severe bacterial infections.

The present study has been undertaken with the aim to study comparative characteristics of woven and non-woven surgical gowns and drapes. The objectives are:

- To develop suitable fabric from cellulosic materials for surgical gown.
- To apply nano cellulose coating on the surface of the fabric.
- To impart the antimicrobial property of the fabric.
- To evaluate antimicrobial characteristics of the coated fabric.

Thus, Chapter 1 contains introduction of entire work, carried out in present study.

Chapter 2 describes the review of literature on various aspects of technical textiles. The review covers important topics comprising of fibres, yarns, fabrics and different materials which can be utilized for number of developments in medical textiles. The danger of synthetic fibres and its effects on pollution is critically mentioned in literature review, which is the most important consideration for today's world.

Various aspects of medical textiles and medical garments have been discussed with the classification and functions. The developments in surgical gowns with the methods of assessing various characteristics have also been highlighted. Antimicrobial materials and textile adhesives are also discussed in literature review.

Chapter 3 contains stage wise details of the entire methodology, while Chapter 4 deals with results and discussions of the experimental work. The materials used in the work are described well. Total work progressed through several stages, which include collection and testing of the fabrics/surgical gowns which are traditionally used in hospitals. These gown fabrics have been tested for water repellence, areal density, thickness, bending modulus etc. To improve fabric properties, numerous trials have been taken, experiencing some hurdles and failures. Finding solutions, critically observing several aspects of improving certain parameters and materials, nano cellulose coating is found as one of the options, which was considered as a final solution.

Nano cellulose has been produced in the laboratory from procured viscose rayon filaments to run a trial. Nano cellulose solution has been prepared in the textile chemistry laboratory. The solution has been then applied on the cotton fabric sample and embossed viscose fabric sample. Treated samples have been tested but expected improvement in above mentioned properties is not achieved.

Thus, in the present work, 3 different fabrics have been processed namely woven cotton dyed fabric, plain hydro entangled viscose blended non-woven and embossed hydro entangled viscose non-woven. Three different concentrations of nano cellulose solution have been prepared i.e.,10 gpl, 20 gpl and 30 gpl. Two different concentrations of cross-linking agents have been used i.e., 5 gpl and 10 gpl, while in some samples, cross linking agent has not been used.

Quantity of nano cellulose has been produced for coating purpose with different concentrations. Cross linking agent has also been used to improve the adhesion of nano cellulose to the fabric samples. With cotton woven fabric and embossed viscose non-woven fabric, a plain viscose nonwoven fabric has also been taken in addition for nano coating.

Baths of different concentrations of nano cellulose and cross-linking agent have been prepared. The coating of nano cellulose has been applied on Padding Mangle machine. Samples have been dried in the electric conditioning oven and then cured in the same oven.

Treated samples have been then tested for their physical properties. The treated samples having better water repellence and reduced satisfactory air permeability have been given neem seed oil treatment to improve anti bacterial property and then are tested for development for the growth of Gram-positive and Gram-negative bacteria in microbiology laboratory. Nonwoven plain viscose rayon sample has been found to be satisfactorily resisting the growth of bacteria.

Chapter 5 concludes the work and indicates that if the surgical gown or fabric is if treated as mentioned above, the gown or fabric will not allow bacteria to generate colonies. Such surgical gown is safe for the surgeon or the patient in operation theatre.

There is a scope for further work, which has been mentioned at the end of Chapter 5.