

Preparation and Characterization of Antibacterial Nonwoven Fabrics

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ABSTRACT

Surgical Drapes, drapes are used in the operating room to cover patients and the area around him to reduce the risk of the wound becoming contaminated by skin cells shed by the patient. Drapes are made from woven cotton or linen, and usually supplied cut to a variety of different shapes appropriate to different surgical procedures and contain an opening according to the position of the surgical site. Nonwoven could also fabrics used as backing material on one or both sides of a film, while the film is impermeable to bacteria. Nonwoven backing is high absorbent to both body perspiration and secretions from the wound. The general requirements for surgical drapes include liquid repellency ,bacterial barrier, conformability, tactile softness, comfort, strength, fiber tie-down properties lint propensity and abrasion resistance, flame resistance, static safety and toxicity

Gowns, surgical gowns should act as a barrier to prevent the release of pollutant particles into the air. They should be an effective aseptic barrier between the under cloths of the surgeon and the aseptic field, and between the patient body other than the prepared area and the sterile field.

Gowns manufacturers are responding to higher demands of protection by producing products with increased barrier level . Gowns are often made from polyester cellulose and composite polypropylene fibers , and are supplied in sterile packs and have the additional advantages of being used in the event of major emergency .Woven cotton fabrics are traditionally used in some surgical gowns because cotton does not produce static electrical charges that can build up and produce electric sparks, however it may release particles from the surgeon and also generate high levels of dust , also non woven surgical gowns are used to prevent sources of contamination .

The general requirements for surgical gowns include liquid repellency, bacterial barrier properties, and aesthetics flame resistance static safety and toxicity, the fabrics should also be sufficiently flexible, with adequate strength , tear resistance and comfort.

Surgical mask ,Masks often have a multiple layers structure to ensure more efficient filtration of the breath . They are made of three layers, the middle layer consists of extra fine glass fibers or synthetic micro fibers covered on both sides by an acrylic bonded parallel-laid or wet-laid nonwoven fabrics. The inner layer consists of a melt – blown polypropylene and outer layer which consists a spun– bonded viscose web to provide strength and to prevent the loss of polypropylene fibers . Masks also contain tapes which are sewn to enable them to be tied firmly into place over the nose and mouth. The performance requirements for surgical face masks are high bacterial filtration capacity, high air permeability , light weight and non-allergenic.

Surgical caps and overshoes, surgical caps and overshoes, are often made of cellulosic fibers, with the parallel– laid or spun laid process . They made in one piece or

from two or three pieces sewn to give a better fit. . Elastic threads are sewn into the edges of the openings to provide simple efficient closure.

Experimental work

Surgical materials are known to be major sources of cross infection, so all textile materials used in the surgical field should prevent or minimize infection or transmission of diseases where in the operating room. However liquids such as blood , sweat ,and saline solutions can carry bacteria with them , and if a liquid is wicked from a surgical gown to a non sterile surface , one or both sides will become contaminated .

Currently there is great interest in protecting healthcare workers from diseases that might be carried by patients in the operating room, a patients, s blood can penetrate surgical fabrics material and possibly contaminate surgeon skin if not well protected, therefore surgical fabrics materials should have antimicrobial properties and blood repellency properties.

There are rare previous studies about developing materials for surgical fabrics with barrier properties for both microorganisms and blood, we therefore undertook this study to develop function of surgical fabrics. In this study, a combination of repellent and antimicrobial finishes was applied to the samples.

Previous studies show that fabrics treated with 1-% Chitosan concentration dissolved in 1% acetic acid exhibits higher antimicrobial properties and hence all samples treated with 1% concentration of Chitosan.

All samples were also treated with novo solution 5 %, 10 % and 15 concentration to achieve water repellency.

There are two methods used to reduce the spread of microorganisms, one of these methods is to make the fabric repellent or a barrier to fluids and the other method is to treat fabrics with antimicrobial finishes that kill microorganisms came in contact with the fabric surface if they are transmitted through them, therefore, the presence of live microorganisms is reduced causing reduction in microorganism transmission

Results & discussion

In this study the researches have developed surgical fabrics materials with antimicrobial and water barrier properties using Chitosan and Novo NB with various concentrations

Polypropylene samples have achieved the highest rates of stiffness, followed by, polyester, cotton, viscose, and then polyester blend with viscose, but the difference was insignificant. From the statistical analysis of stiffness results and diagrams it is clear that there is a direct relationship between weight/m2 and stiffness. It could be stated that high weight samples contain more fibers and hence the total shear force within the fabric is higher. From the statistical analysis of stiffness test it is clear that there is direct relationship between novo NB concentrations and fabric stiffness .I can state that the increase of concentrations causes an increase in weight and thickness and hence an increase stiffness.

It is also obvious from the statistical analysis of weight test that there is direct relationship between Novo NB concentrations and weight .I can state that the increase of concentration ratio cause an increase in weight.

From the statistical analysis of antimicrobial test it could be stated that the efficiency of the antimicrobial finish is not affected by the repellent finish, but the effectiveness of the repellent finish varies with the add-on level of the antimicrobial.