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STUDY OF PROTECTIVE PROPERTIES AND CHARACTERISTICS OF MEDICAL GLOVES

Abstract

In this article, we will analyze the main stages of production of medical gloves, including latex and nitrile gloves. Acrylonitrile butadiene rubber is an elastomer with a fairly impressive set of properties: increased resistance to oils and solvents, tensile strength, abrasion resistance, bending resistance, increased residual deformation under compression and resistance to migration and loss of volatile substances, color retention, weather resistance, and aging resistance. The article also provides the results of studies of the stages of the glove production process. The following production stages are defined: preparation of glove molds; immersion of molds in solution; vulcanization; leaching; formation of a cuff bead; finishing process (chlorination, polymer coating); removal from molds. The article provides the results of quality tests carried out in laboratory conditions.

Keywords: medical, latex, nitrile, vinyl, chainmail gloves chlorination, polymer, powder.

Introduction. At the beginning of the process, it is necessary to rid the mechanical hand forms of any dirt , using soapy water , and then in a chlorine-containing solution. Any foreign substance on the surface of the form can lead to the formation of tears in the glove. After this, the caramic forms pass through a series of rotating brushes [1] . This is necessary to clean the hard-to-reach areas between the fingers. Then the forms are dipped in a container with hot water and then dried a little. Still slightly damp forms are immersed in a chemical solution, which forms a film on their surface. After this, the ceramic forms are immersed in a warm solution. To increase chemical To increase the durability and elasticity of the gloves, the molds are immersed in a tank containing an acrylonitrile butadiene compound, which may include other additives and colorants. Reacting with the film, it acquires a gel-like structure. Rotation allows excess drops to be removed from the molds before heat treatment. Under the influence of heat, the solution dries [2]. The vulcanization process also occurs in the oven, increasing the strength and elasticity of the glove.

Experimental part. Working with various substances and chemical reagents determines the choice of the appropriate type of gloves [3]. Modern medical gloves differ in the characteristics of the material from which they are made, its chemical composition, production and processing technology, as well as the possibilities of their intended use. Figure 1 shows the stages of production of medical gloves. During the final processing, the gloves undergo special treatment to make them easier to put on. Traditionally, glove manufacturers used powdering. Nowadays, this technology is considered obsolete and is used mainly in the production of latex gloves [4] . Modern methods for making it easier to put on nitrile gloves most often undergo one of two procedures: chlorination and polymer coating . The technical characteristics of the resulting gloves (length of the gloves and thickness of the material used to make them) comply with SS 3-88 [5].

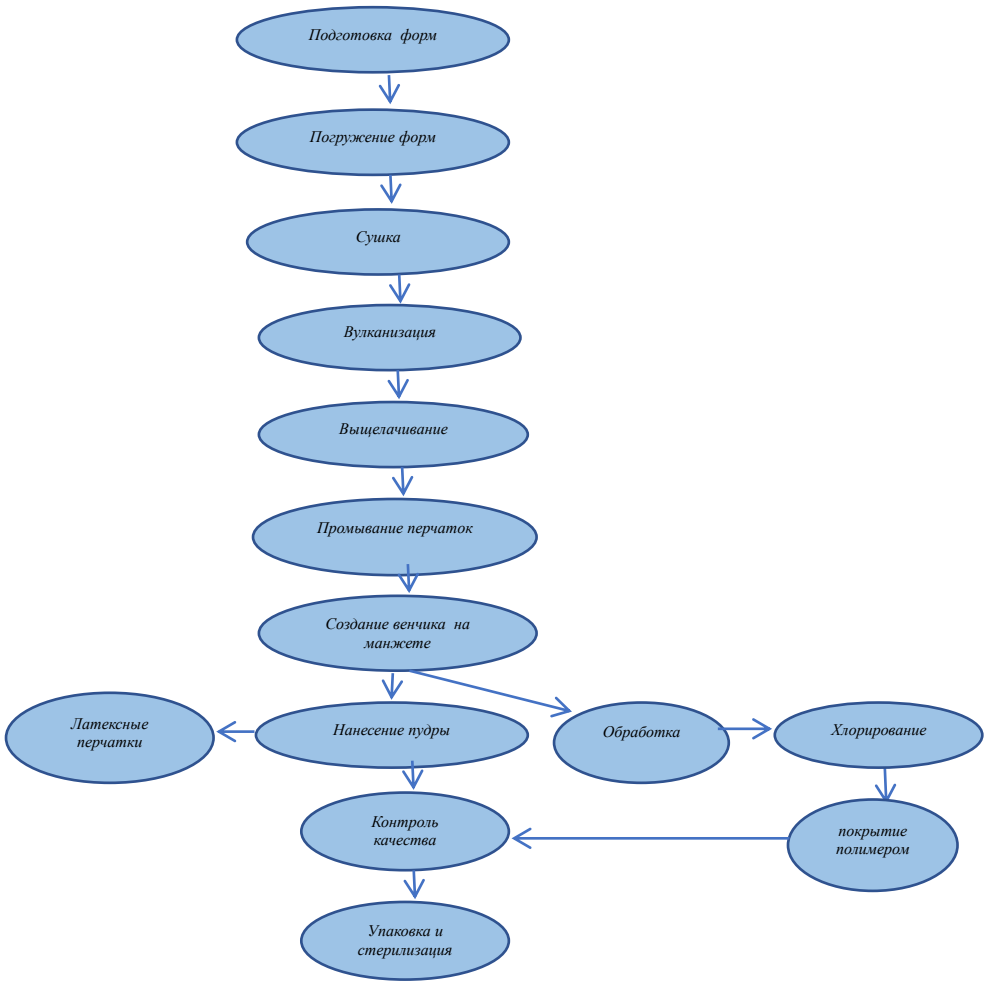

Figure -1. Stages of production of medical gloves

Results and discussion

Tests, conducted in laboratory conditions , showed good chemical resistance and physical characteristics of gloves . Resistance to cuts, punctures and abrasion were also taken into account as a critical factor when using the product. Contact of gloves with aggressive environments always operates in two cases: permeability and degradation [6] . When a glove comes into contact with a conditionally aggressive substance, its degradation begins and, as a result, the penetration coefficient increases. Table 1 lists several chemical substances for medical gloves.

Table -1- Selection of a specific aggressive environment for medical gloves

Chemical substance	Latex gloves	Vinyl gloves	Nitrile gloves
Acetaldehyde	F	N	N
Acetamide	F	N	N
Acetate is a solvent	N	F	F
Acetic acid 80%	F	F	F
Acetic acid 20%	N	G	G
Acetyl chloride (dry)	N	F	N
Acetylene	G	E	G
Acrylonitrile	G	G	N
Acrylic acid	G	-	G

Designations accepted in the table:
E (excellent) - absolutely safe work
G (good) - safe work
F (fair) - can work, conditionally safe work
N (not recommended) - it is not recommended to work - no data

Some glove materials may become hard, rigid, brittle, or they may become softer and swell, increasing in volume to several times their original size. If a chemical significantly affects the physical properties of the glove material, its resistance to penetration will rapidly deteriorate.

Conclusions

In accordance with the Sanitary Rules " Sanitary and Epidemiological Requirements for Facilities in the Sphere of Circulation of Medicines and Medical Devices" [6] , the minimum thickness of smooth examination gloves must be 0.08 mm, and textured 0.11 mm ; the thickness of smooth surgical gloves is 0.1 mm, textured 0.13 mm. The minimum length of examination gloves is 220 mm, and that of surgical gloves is 255 mm. The size of medical gloves must correspond alphabetic and numeric glove size designations . Size XS corresponds to sizes 5.5 and 6; S – 6, 6.5 and 7; M – 7, 7.5 and 8; L – 8 and 8.5. The rules for the use of medical gloves must comply with SS 12.4.307-2016 [7] .

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МЕДИЦИНАЛЫҚ ҚОЛҒАПТАРДЫҢ ҚОРҒАНЫШ ҚАСИЕТТЕРІ МЕН СИПАТТАМАЛАРЫН ЗЕРТТЕУ

Түйін

Бұл мақалада біз медициналық қолғаптарды, соның ішінде латекс пен нитрилді қолғаптарды

өндірудің негізгі кезеңдерін талдаймыз. Акрилонитрилді бутадиенді каучук-бұл өте әсерлі қасиеттері бар эластомер: майлар мен еріткіштерге төзімділіктің жоғарылауы, созылу беріктігі, тозуға төзімділігі, иілуге төзімділігі, сығымдау кезінде қалдық деформацияның жоғарылауы және ұшпа заттардың миграциясы мен жоғалуына төзімділігі., түсті сақтау, ауа райына төзімділік және қартаюға төзімділік. Мақалада қолғап өндіру процесінің кезеңдерін зерттеу нәтижелері де берілген. Өндірістің келесі кезеңдері анықталған: қолғап қалыптарын дайындау; қалыптарды ерітіндіге батыру; вулканизация; сілтілеу; манжетті моншақ қалыптастыру; әрлеу процесі (хлорлау, полимерлі жабын); қалыптардан шығару. Мақалада зертханалық жағдайда жүргізілген сапа сынақтарының нәтижелері келтірілген.

Кілттік сөздер: медициналық, латекс, нитрил, винил, шынжырлы қолғаптар хлорлау, полимер, ұнтақ.

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ИССЛЕДОВАНИЕ ЗАЩИТНЫХ СВОЙСТВ И ХАРАКТЕРИСТИК МЕДИЦИНСКИХ ПЕРЧАТОК

Аннотация

В этой статье мы проанализируем основные этапы производства медицинских перчаток, включая латексные и нитриловые перчатки. акрилонитрилбутадиеновый каучук - это эластомер с довольно впечатляющим набором свойств: повышенной стойкостью к маслам и растворителям, прочностью на растяжение, истиранию, изгибу, повышенной остаточной деформации при сжатии, стойкостью к миграции и потере летучих веществ, сохранению цвета, атмосферостойкости и старению. В статье также приводятся результаты исследований этапов процесса производства перчаток. Определены следующие этапы производства: подготовка форм для перчаток; погружение форм в раствор; вулканизация; выщелачивание; формирование бортика манжеты; завершающий процесс (хлорирование, полимерное покрытие); извлечение из форм. В статье представлены результаты испытаний качества, проведенных в лабораторных условиях.

Ключевые слова: медицинские, латекс, нитрил, винил, кольчужные перчатки, хлорирование, полимер, порошок.