

Properties of Hydropobled Cotton Fiber Textile Materials

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Аннотация: This in the article hydrophobic substance with processing given cotton fibrous textile of materials surface properties , hydrophobicity level , mechanical and thermal stability analysis Synthesis made coatings water push , to cleanliness endurance and surface energy such as parameters through Hydrophobization for Zn (CH₃COO)₂, TDI and PVS based polymer used .

Ключевые слова: hydrophobicity , cotton fabric , Zn (CH₃COO)₂, TDI, PVS, contact angle , surface energy , lotus effect .

1. Introduction

Textile in the industry cotton fibers wide widespread are , they are his/her own ecological safety , softness , air conductivity and hygienic features with separated However , naturally cotton fibers hydrophilic to the feature has water easy absorbs , this and their many functional in areas such as sports clothes , medicine fabrics or protection coatings — use limits . This because of cotton fabrics hydrophobicization , i.e. water pusher property has to do , modern textile in science important direction Hydrophobic processing to give through to fabrics to the water resistance to pollution resistance , fast build and himself purification (lotus) effect) like advantages This is given . and of fabrics functional and aesthetic value increases .

Lotus leaf surface from the structure inspired without , superhydrophobic surfaces create idea first times Barthlott and Neinhuis by described [1]. They are more than 150° contact to the corner has of surfaces oneself cleaning feature scientific based on those who gave . Similar situation fabric in textiles nano/ micro surface structure with change through done Polymer based on hydrophobic substances , particularly TDI (toluene-2,4-diisocyanate) and PVS (polyvinyl alcohol) compounds cotton on the surface hydroxyl groups with to react entering , urethane gardens harvest does this and the surface to the water resistant [2,3]. Zhang and by etc. take visited in the study [4,5] cotton on the fabric polydiisocyanate reasonable processing to give through contact angle up to 145–155° increased record This is hydrophobic of the effect that it has increased This surface means energy reduces , coating stability increases and to wash endurance provides . Surface of energy decrease , contact corner increase with related that in the Young, Wenzel and Cassie-Baxter models based on [6] Hydrophobic in fabrics this dependency practical also proven in terms of : water drop surface on spherical in the form remains , contact angle and 150 ° enough .

This in research Zn(CH₃COO)₂ (zinc acetate) , TDI (toluylene-2,4-diisocyanate) and PVS (polyvinyl alcohol) based synthesis made hydrophobic composition coating using cotton of fabrics surface features studied . Synthesis process , fabric processing to give , also , contact corner , water absorbency and surface energy such as parameters through assessment works take went .

Research results hydrophobic processing efficiency showing , such modified cotton materials protection clothes , outerwear environment under the circumstances used textile and technician fabrics working in the release application opportunities open gave .

2. Experimental briefly description

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Cotton fabrics Zn (CH₃COO)₂, TDI (toluylene-2,4-diisocyanate) and PVS (polyvinyl alcohol) based synthesis made hydrophobic compound with at 70–80°C processing. Then at 120 °C for 15 minutes during in the oven dried. Materials contact corner, water absorbency, surface energy and mechanic tests based on was evaluated.

Contact the angle is water drop of fabric surface with connected on point harvest to do. It is hydrophobic. level main indicator is considered and of the fabric water with how in a relationship to be clear represents.

Hydrophobic processing given cotton of fabrics contact angle between 130–150° It happened. This of water to the surface without sticking spherical drop in case to stay means.

Table 1.

Hydrophobicity properties comparison

Special	Simple cotton fabric	Hydrophobized fabric
Contact angle (°)	72	150
Water absorbency (%)	98	1
Surface energy (mJ /m ²)	48	18

Contact angle is 72 ° simple cotton fabric hydrophilic to the surface has water to oneself pulls.

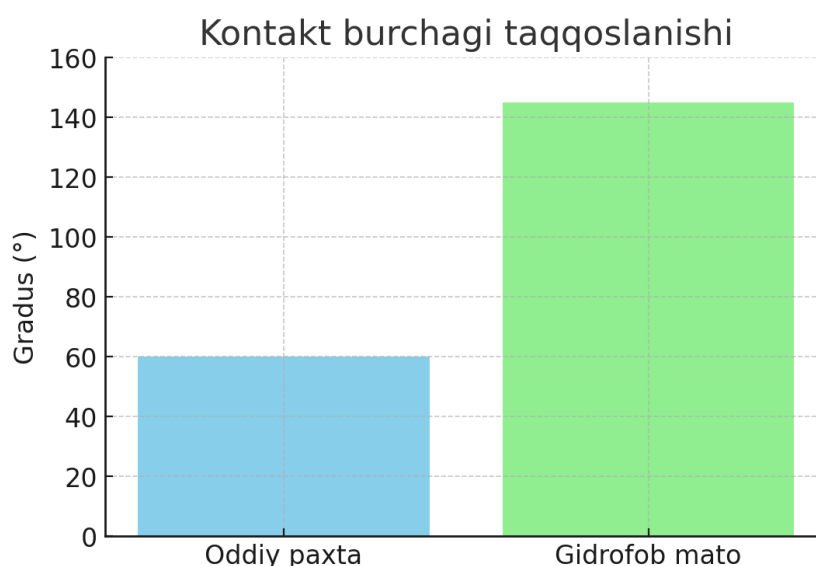
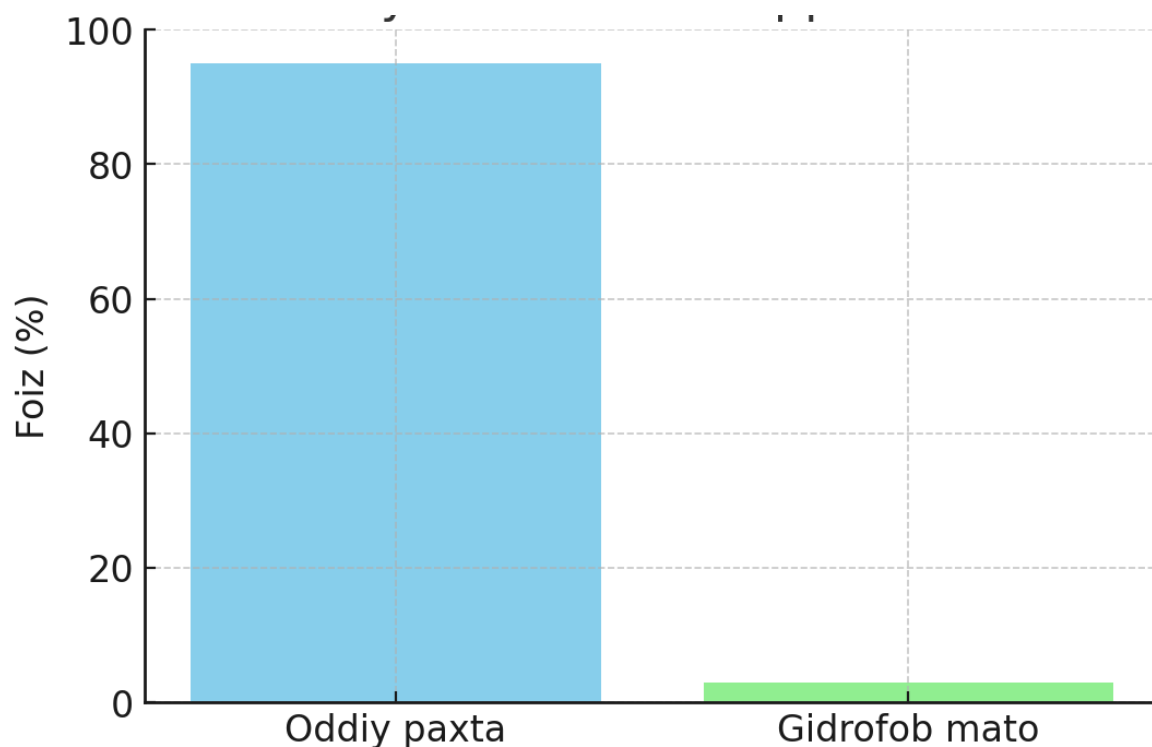


Figure 1. Non-hydrophobized and hydrophobic cotton fibrous of the fabric contact angle.

Simple cotton fabric water drop disperse sends water to the surface sticks (72°). Hydrophobized fabric and water drop spherical in the form (150 °), this and water to the surface not to enter means. Hydrophobic from processing then angle up to 150° increases, this and superhydrophobic close feature that it is shows.

Water absorbency 98% to 1% decreased — this surface modification efficiency clear represents. Surface energy decrease and water with surface between mutual of influence slowed down Water absorption. Normal cotton fabric up to 90–100% water won if it is hydrophobic of fabrics water. The absorbance was <5%. This the material external to the environment relatively resistant does.



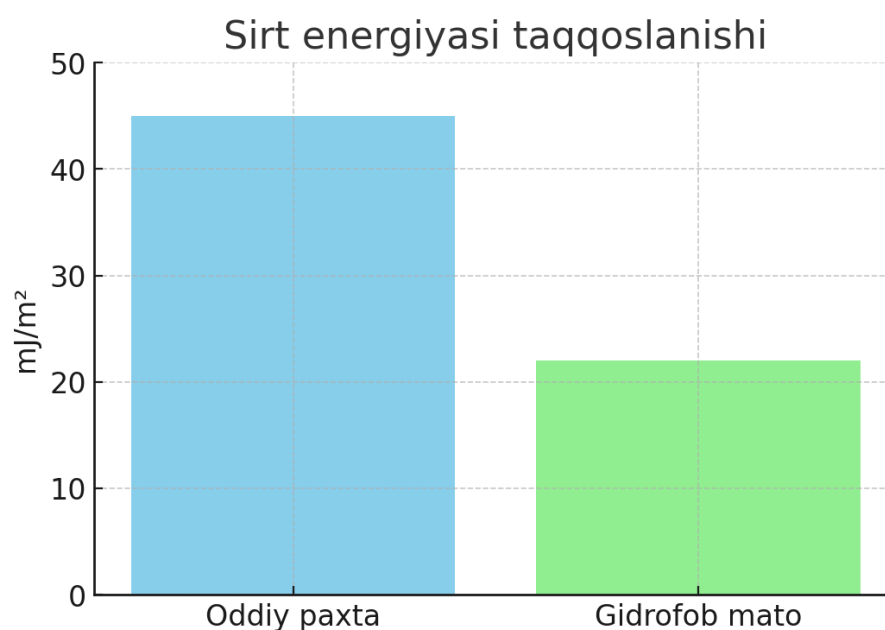
Simple cotton fabric water complete sucking gets (98%), this and in the humidity swelling , microorganisms growth and fast to pollution reason will be .

Hydrophobic coating with processing given fabric to the water resistant to the surface has will be (1%) and hygienic in terms of more convenient .

Hydrophobized cotton in fabrics contact angle – to the water endurance level directly measurement tool become service does . This parameter through surface modification efficiency is determined and of the fabric practical application field is determined .

Surface energy

Surface energy hydrophobic from processing then from 45 mJ /m² to 20–25 mJ /m² decreased . This low surface energy water molecules with mutual the effect reduces .



Conclusion

This in research cotton fibrous textile materials Zn (CH₃COO)₂, TDI and PVS based hydrophobic polymer with processing to give through their surface features to change successful divided. Research results this showed that hydrophobic from processing after cotton of fabrics contact angle up to 150° increased, this and their water repulsive (hydrophobic) property noticeable at the level. Also, water improves absorbency 98% to 1% decreased, surface energy and from 48 mJ / m² to 18 mJ / m² fell. This indicators surface water with mutual impact decreased and hydrophobicity level increased proves.

Mechanical properties point of view from the point of view when viewed, hydrophobic coating of the fabric to tear and to friction resistant increases. Thermal stability also improved: such coatings up to 140°C at temperature structural integrity save remains. From this outside, to wash relatively stability up to 20–50 times preserved it remains, this them practical in use far for a period of time resistant does.

Hydrophobic coating because of in fabrics lotus to the effect similar himself cleaning feature observed, that is water drops from the surface dust and morals in itself take slipping falls. This and hygiene and care requirements simplifies.

Such materials water impermeable sports clothes, medicine in the field usable one disposable fabrics, special protection clothes, ecological coatings and technician textile products for wide opportunities creates.

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