



## Research on Antifouling and Easy Decontaminating by a New Method

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### Abstract

Study the effect of blending hydrophilic agent and water and oil repellent agent on cotton fabric property of antifouling and easy decontaminating. The study shows that blending could make the fabric have property of antifouling and easy decontaminating.

**Keywords:** Antifouling and easy decontaminating, Blend, Cotton fabric

### 1. Introduction

For many years, workers had done plenty of researches on fabric of water and oil proofing. fluorine-contained finishing agent has been received much attention for its excellent property of water and oil repellent, soil release (Zhen.Wan, 2005).

For overcoming the disadvantages of the single water and oil repellent or soil release finishing, the agent which contains oil repellency chain segment and hydrophilic segment was developed out. The fabric which finished by this agent can have the property of water and oil repellent on dry, and the soil release property on wet (Shungen, Zhu, 1997). At present, soil release finish agent is almost copolymer compounds which contain hydrophilic part and water and oil repellent part (Zhijun. Zhang, 2004). This finishing agent high in price and is synthesis complexly. So it is necessary to search a new method to reach the effect of antifouling and soil release property. Fluorine part of this copolymer soil release finishing agent play a role in water and oil repellent on dry, hydrophilic part plays a role in soil release in wet. So we can think that can we mix the water and oil repellent agent and hydrophilic agent to reach the same effect as the copolymer antifouling and soil release finishing agent? Use macroscopic method to solve microscopic problem, so this can reduce cost greatly.

### 2. Experiment

#### 2.1 Experimental material

Cotton plain weave cloth, water and oil repellent finishing agent (FK-510), moisture adsorption and perspiration exhaust finishing agent( FK-829).

#### 2.2 Equipment

Double roll padder (switzerland), YHW-102 dry box (changsha,china), whiteness instrument(U.S.A datacolor company), contact angle instrument(chengde, china)

#### 2.3 Technological processes

Double-dipdouble-nip→drying (100°C×1.5min)→baking(160°C×3min)→washing→drying

Finishing prescription: FK-510: 60g/L

FK-829: Xg/L

<Table 1>

#### 2.4 Test

Grade evaluation of water and oil repellent uses PRC professional standard ZB W 04015-89.

Use contact angle instrument to test the contact angle on every grade of water and oil repellent.

Use whiteness instrument to test the whiteness of washed cloth

### 3 result and discussion

#### 3.1 Test cotton fabric property of water and oil repellent finished by mixed agent

For Studying on the influence of hydrophilic segment FK-829 on the property of water and oil repellent, we test the cotton fabric contact angle on every grade of water and oil repellent which finished by mixed agent.

<Figure 1 & Figure 2>

We can directly recognize from the Figure 1 and 2, when the oil repellent grade is 6 grades below, contact angle had no remarkable changed. So adding hydrophilic agent (FK-829) had no impact on the effect of water and oil repellent. Grade 6 can meet the daily need.

But when added the octane, contact angle increased first then decreased, the reason may be as below:

(1) In Figure 1, the property of oil repellent improved with the hydrophilic agent amount increasing, the reason may be that when adding little hydrophilic agent, this can make fiber surface rough, so the fabric obtained high water and oil repellent property.

(2) When the percentage of hydrophilic agent was 33.3%, the fabric water and oil repellent property decreased. This may be that when hydrophilic agent reached a certain percentage, arrangement and distribution of the finishing agent in fiber changed. The continuity of the membrane in fiber which the finishing agent formed decreased. So the oil repellent is lower. But the water and oil repellent grade is still 6.

#### 3.2 Test cotton fabric easy-rinse property finished by mixed agent

<Figure 3 & Figure 4>

K/S expresses depth of fabric surface. The high value represents that much dirt residues on the fiber surface, in another words, effect of decontamination is bad. We can recognize from the Figure 3 and 4, the easy-rinse property improved with the hydrophilic agent amount increasing, namely increasing cotton fabric hydrophilicity helps to improve decontamination effect. From water and oil repellent effect whiteness test result, the proportion of water and oil repellent agent and hydrophilic agent is 2:1.

### 4. Conclusions

This study is a new method of antifouling and easy decontaminating finishing, namely mix water and oil repellent agent and hydrophilic agent to finish fabric to reach the same effect of fluorine-contained soil release finishing agent at present. After comparison and analysis the following results are provided:

(1) Water and oil repellent effect related to concentration of water and oil repellent finishing agent, the higher of the concentration, the better of the water and oil repellent effect. But increase to a certain concentration, water and oil repellent effect does not improve obviously with the water and oil repellent agent amount increasing.

(2) The fabric finished with the mixed agent had water and oil repellent and easy-rinse property. Feasibility of this new method was validated primitively. When water and oil repellent agent and hydrophilic agent were mixed in a best certain proportion, the fabric could obtain a good property of water and oil repellent and easy-rinse. From water and oil repellent effect and whiteness test result, the proportion of hydrophilic agent is 33.3%.

### References

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Table 1. The finishing agent content of every fabric sample

Serial number	water and oil repellent agent:hydrophilic agent	Proportion of hydrophilic agent
1	6:1	14.2%
2	3:1	25%
3	2:1	33.3%
4	3:2	40%
5	1:1	50%

Mangle expression : 70%

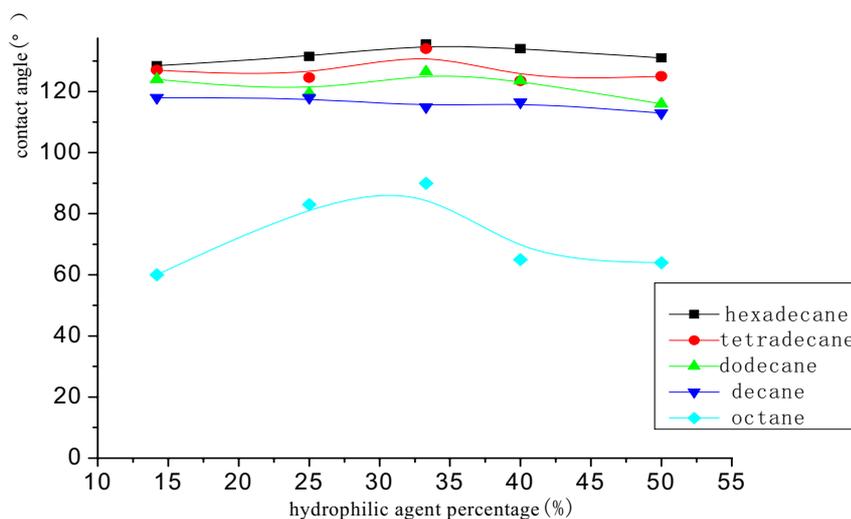


Figure 1. The relation of hydrophilic agent percentage and contact angle

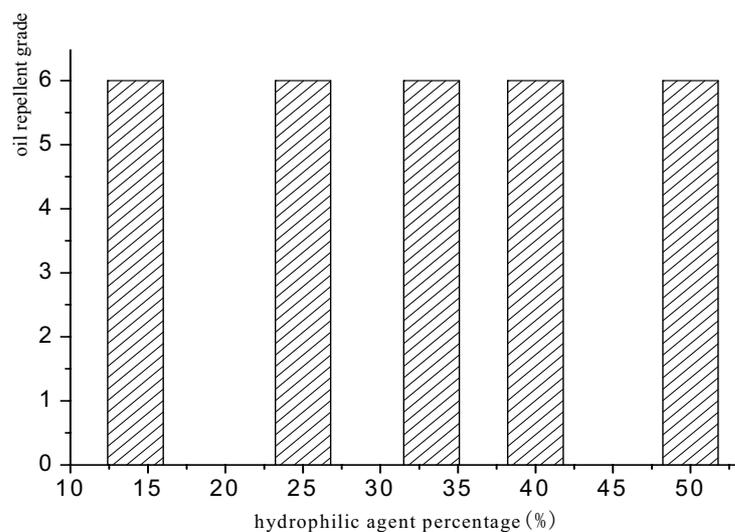


Figure 2. The relation of hydrophilic agent percentage and oil repellent grade

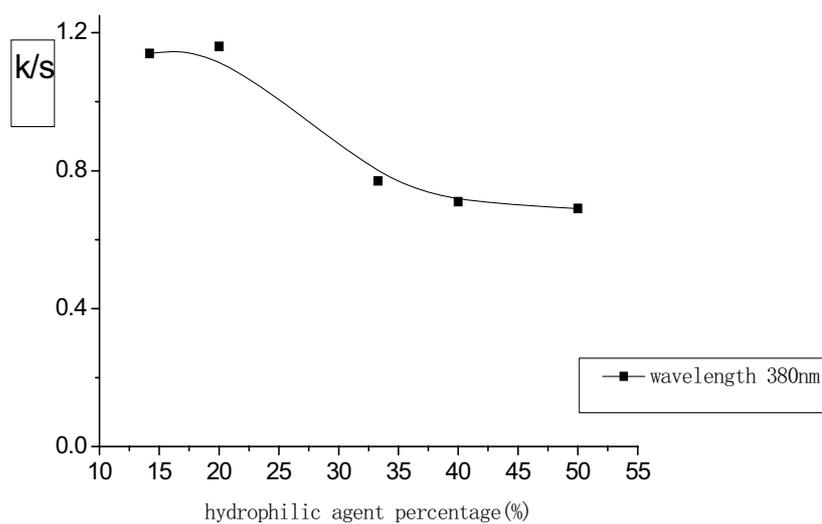


Figure 3. The relation of hydrophilic agent percentage and k/s

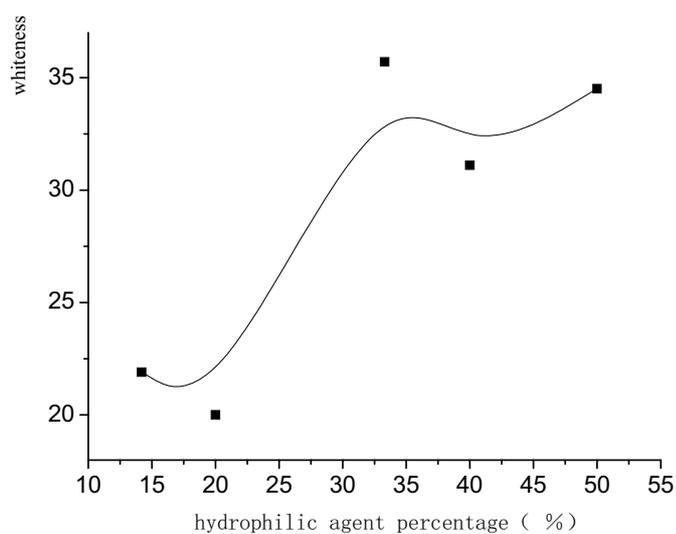


Figure 4. The relation of hydrophilic agent percentage and whiteness