

COMMUNICATION

Chemistry

PROCESSING OF OVER-GARMENT FOR SKIN PROTECTION

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In the article researches on increase of hydrophobic properties of protective clothes are given. This makes it possible to spend, if necessary, a longer time on the territory infected with toxic substances while remaining safe. The results of the research are protected by the corresponding RA patent.

Keywords: hydrophobic, marginal wetting angle, adhesion, surface substance.

Introduction. Industrial (special) clothing, such as vests and pants, jumpers, hood robes can be firstly used as a simple way of human skin protection they are mostly made of heavy canvas, fire-resistant or elastic fabrics and coarse cloth. They are able to protect people not only from radioactive substances, bacterial agents but also to retard the penetration of poisoning liquid substances for a short time (from 30 to 60 *min*). The ordinary clothes should be saturated with special solution so as it could protect the skin from toxic substances, vapours and aerosols. It is known that the solution can be prepared through synthetic liquid detergents (OP-7, OP-10 and others) [1].

Materials. The over-garment, processed with the solution of surfactant (SAA) of monoalkyl phenyl ester polyethylene glycol ($C_nH_{2n+1}C_6H_4O(C_2H_4O)_mH$, brand OP-7, when $m = 6; 7$ or brand OP-10, when $m = 10; 12$) is characterized by low hydrophobic features.

The over-garment has been investigated and processed with 1% organosilicone solution of “Dali” brand (LLC “Rogneda”, RF: TC 2229–056–13238275–2007).

The aim of the research is to find an efficient method for processing an over-garment, which will provide its hydrophobic capacity that is the given over-garment can protect the human skin from external impacts (toxic substances, aerosols and bacterial agents) [2].

Research Methods and Experimental Results. The whole experimental process is carried out in well known spinning drum methodology [3, 4]. At first the preliminary processing of the outerwear with acetone in spinning drum is carried

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out: liquid ratio l.r.=4, temperature is $20\pm 2^{\circ}\text{C}$, duration is 4 h. Then the used acetone liquid is poured out and the 1% solution of organosilicone hydrophobic substance of “Dali” brand is added into the drum and again under the conditions of drum rotation the outerwear is processed. The processing conditions are the following: temperature is $20\pm 2^{\circ}\text{C}$, the duration is 4 h, l.r.=4, liquid pH 11.6. Then the clothes’ samples (cotton fabric) are dried in the air and experimented. The examples of the experiment are introduced in Tabs. 1 and 2.

Table 1

Experimental conditions of over-garment samples

	Variants of processed substance	Composition and quantity of the processed substance, %		Liquid ratio	t, °C of the process	Duration, h
		preliminary processing	hydrophobization			
1	jumper	acetone 100%,	organo-silicone hydrophobic 1% water solution of “Dali” brand	4	20 ± 2	4
2	robe	acetone 100%,	organo-silicone hydrophobic 1% water solution of “Dali” brand	4	20 ± 2	4
Control	3	–	SAA (surfactant) 17% solution of OP-10 brand	4	40–50	4
	4	–	SAA (surfactant) 17% solution of OP-10 brand	4	40–50	4

Tab. 2 shows that the marginal wetting angle of surface water drop of the sample processed through the recommended method is larger after 5 min particularly in the jumper sample making 105°C and the work of adhesion makes $53.9\cdot 10^{-3}\text{ N/m}$. Water absorption capacity in the testing sample decreases 1.8 times both in case of jumper and robe as compared with that of control variant.

Table 2

Experimental results of over-garment samples

Property	Examples			
	1	2	control	
			3	4
Water drop on the sample surface, marginal wetting angle after 5 min, θ , degree	105	70	0	0
Water drop on the sample surface, the work of adhesion after 5 min, $W\cdot 10^{-3}\text{ N/m}$	53.9	97.6	–	–
Water absorption capacity, %	120.2	102.5	217.2	181.3

Conclusion. Processing of the protective over-garment through the new method enables the clothing to gain higher hydrophobic properties, therefore, the sites contaminated with toxic substances can be handled with for a long-term period coming out of the infected area quite safely.

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