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The Development of an Optimal Formulation of Detergent

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ABSTRACT: The effect of sodium carbonate on the effective viscosity and detergents is studied. It is shown that the addition of sodium carbonate in an amount of 3.0-4.0 % to the mass of the soap base allows you to provide the desired consistency with a typically high washing capacity.

KEYWORDS: Detergent formulation, sodium carbonate viscosity, detergent action, use of soap base.

I. INTRODUCTION

Detergents are used in everyday household needs, medicine and for other purposes [1-3]. The use of soap and soap-like substances has been known for a long time and is widely developed today. [4.5].

Significant development of industrial soap making refers to the Russian Federation [6,7] and foreign [8,9]. This was facilitated by studies of the composition of fats, given in [10, 11], the development and implementation of industrial methods for the preparation of soda ash and caustic soda, as well as the technology of production of household and toilet sorts of soap. Detergents sold on the consumer market are produced in foreign manufacturing enterprises, they are imported in the republic at a high cost with the consumption of foreign currency. The detergents produced in small and own enterprises do not meet the standards, sanitary and hygienic requirements in terms of the main indicators. There are sufficient opportunities in the republic for the production of detergents, for this there are enough local and non-traditional raw materials with a lower cost and chemicals.

In this regard, research in the direction of creating the production of toilet soap, improving their quality and expanding the range, using new types of raw materials in the detergent formulation, mastering scientifically grounded and environmentally friendly technologies in production practice are important and relevant.

When developing the formulation of detergents, the problem of increasing the detergent action of the soap base was solved while limiting the foaming properties and providing a plastic pasty consistency characteristic of traditional detergent pastes, the effective viscosity of which is 40-50 Pas at a shear rate of 3-5 s⁻¹.

Taking into account the tasks set, sodium carbonate was chosen as a functional additive.

Figure 1 shows the results of studies to identify the effect of sodium carbonate on the effective viscosity and detergent performance of a detergent.

It has been shown that the addition of sodium carbonate in an amount of 3.0-4.0% to the mass of the soap base makes it possible to provide the desired consistency with a sufficiently high washing ability.

The developed formulation of the detergent is presented in Table 1, and Table 2 presents its main indicators and functional properties.

It has been shown that the soap base has a sufficiently high detergent effect.

It has been established by experience that the agent exhibits the greatest detergent effect when washing hydrophobic contaminants from metal or cotton fabric surfaces.

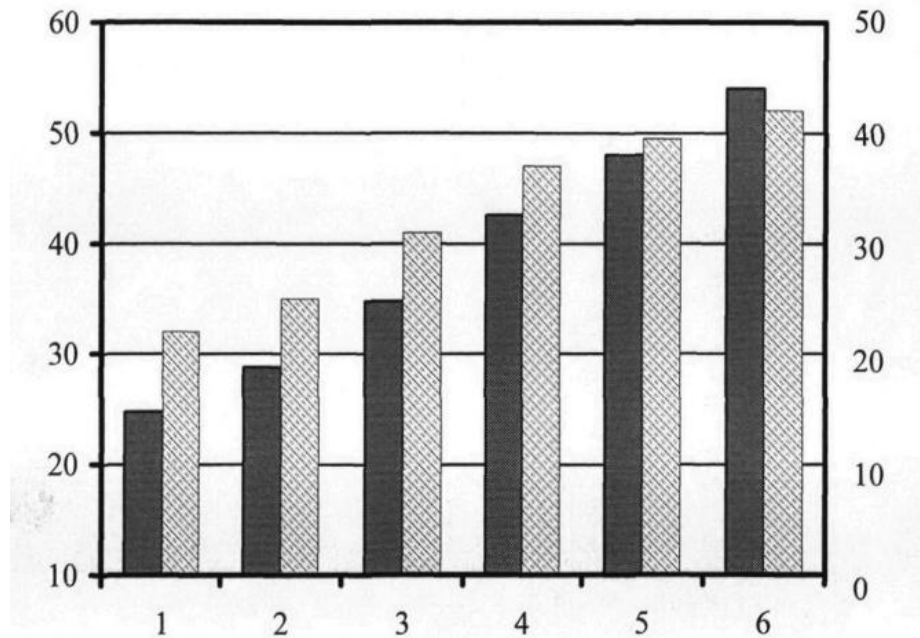


Fig 1 - Influence of sodium carbonate on the effective detergent action of the detergent

Table 1.

Washing paste recipe

Name of raw materials components	Mass fraction of components by recipe variants, %
Soap base made of shavings	95,0-95,5
Soda ash	3,0-4,0
Fragrance	1,0-1,5
Total	100,0

The composition of the shavings is palm stearin + palm oil + palm kernel oil.

Table 2

The main indicators and functional properties of the detergent

Name of indicator	Characteristic and value of the indicator
Colour	Light yellow
Smell	Pleasant, characteristic of the fragrance used
Uniformity	The uniformity is maintained at a temperature of 0 to 30 °C
Consistency	Plastic, pasty
Mass fraction, % of	
free sodium hydroxide	0,04
free sodium carbonate	4,0
Functional properties of 0.25% solution in medium-hard water foaming capacity, No / N 5>m	140/129
washing effect, % at temperature:	
50°C	38,7
80°C	46,9
antiresorption capacity, % preservation of fabric whiteness	62,4



A sufficiently high content of sodium carbonate makes it necessary to recommend avoiding contact of the detergent with the skin surface.

The analysis of the identified properties allows us to recommend the developed detergent for use for technical purposes when washing production equipment, as well as washing filters surfaces.

The relatively low foaming properties allow the detergent to be used for mechanized washing of highly polluted industrial fabrics, such as fabric filter elements.

The results of the evaluation of the main quality indicators and functional properties of the developed detergent during storage are presented in Table 3.

Storage was carried out in a polypropylene jar with a capacity of 200 cm³ with a tightly closed lid at room temperature without direct access to sunlight.

Table 3

Changes in the main indicators and functional properties of the detergent during storage

Name of indicator	Characteristics and value of the indicator for the shelf life		
	1 month	6 month	6 month
Colour Smell Uniformity Consistency	Light yellow unchanged Unchanged: pleasant, characteristic of the fragrance used Homogeneous Plastic, pasty		
Mass fraction, % of			
free sodium hydroxide	0,04	0,03	0,02
free sodium carbonate	4,1	3,9	3,7
Functional properties of 0.25% solution in medium-hard water foaming capacity, No / N 5>m	140/130	140/129	140/129
washing effect, % at temperature:			
50°C	38,7	38,5	38,4
80°C	47,0	46,9	46,8
antiresorption capacity, % preservation of fabric whiteness	62,5	62,3	62,0

As can be seen from the presented data, the developed detergent retains its consumer characteristics for 12 months in storage.

Thus, the studied and developed formulations of detergents provide their high detergent properties and allow them to be used for household and technical needs.

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