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Cleaning And Discoloring of Raw Fatty Acids of Cotton Soap stock Purpose to Expand the Field of their Application

DildoraRuzmetova, DilnozaSalixanova, AvezSharipov

Teacher, Urgench State University, Xorazm, Uzbekistan
Doctor of technical sciences, Institute of the general and inorganic chemistry AS of Rep Uz, Tashkent, Uzbekistan
Doctor of pharmaceutical sciences,Tashkent Pharmaceutical Institute, Tashkent, Uzbekistan

ABSTRACT. In this work, studies of the colloidal chemical properties of cotton soap stock fatty acids products show more potential for widespread use of such surfactants in various sectors of the economy. At the same time, it is necessary to increase their quality indicators, in particular color, due to the presence of gossypol, chlorophyll and their derivatives in them. Removing the latter from fatty acids makes it possible to obtain a lighter color surfactant than from cotton soapstock

KEYWORDS: Fatty acids, surfactants, gossypol, soap stock, miscella, surface tension, wetting ability.

I. INTRODUCTION

Unlike soap stocks obtained by alkaline refining of light vegetable (sunflower, soybean, safflower, etc.) oils, cotton has a dark brown color, due to the presence of gossypol, chlorophyll, and their derivatives [1]. This necessitates the distillation of crude fatty acids isolated from cotton soap stock.

Currently, the oil and fat industry is one of the leading sectors of the economy of Uzbekistan, where more than 50 thousand tons of cotton stock is accumulated annually.

The processing of cotton soap stock is aimed at obtaining fatty acids for the production of soap, surfactants, synthetic detergents, emulsifiers, etc.

Due to the termination of sperm whale capture in the world, the production of surfactants has lost the main raw material, from which a mixture of saturated ($C_{16:0}$, $C_{18:0}$) and unsaturated ($C_{16:1}$, $C_{18:39}$, $C_{18:2}$, $C_{18:1}$) fatty alcohols was obtained . Therefore, today the main focus is on fatty acids derived from vegetable oils [2].

Traditionally, cotton soap stock processing is carried out according to the following scheme: soap stock drainage with alkali, decomposition of the formed soap with sulfuric acid, and washing of the isolated fatty acids to a neutral reaction (pH = 7).

II. SIGNIFICANCE OF THE SYSTEM

In this work, studies of the colloidal chemical properties of cotton soap stock fatty acids products show more potential for widespread use of such surfactants in various sectors of the economy. The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. METHODOLOGY

In practice, often the resulting fatty acids are poorly washed from sodium sulfate and have unsatisfactory quality indicators. Therefore, crude fatty acids are subjected to distillation and, in some cases, adsorption purification [3,9].

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It is known that a consequence of the surface activity of crude fatty acids is their manifestation of foaming, emulsifying, peptizing and other abilities. So, for example, sodium salts of fatty acids form a stable foam, while tar and low molecular weight naphthenic acids are slightly foaming.

Surfactants obtained from unsaturated fatty acids give a weak foam [4]. In this case, sodium oleate has the best foaming ability at a temperature of 20-400C. Moreover, potassium salts of high molecular fatty acids foam better than sodium.

Therefore, in the synthesis of new surfactants, it is necessary to take into account in the future what medium and temperature they will be used.

Soap stocks, regardless of the type of vegetable oils subjected to alkaline neutralization, are characterized not only by the total fat content and its neutral and bound form, but also by the presence of concomitant ones (gossypol, chlorophyll and their derivatives, carotenoids, phosphatides, metal residues, unsaponifiable substances, alkali, etc. p.) substances. Their number changes during the extraction of oils from oilseeds by pressing and extraction. Since aqueous solutions of sodium salts of fatty acids are strong surfactants, they are adsorbed at the interface between water and air, lower the surface tension of water and, when concentrated, form the thinnest two-dimensional films with mechanical strength. In addition, this surfactant is well wetted by a variety of (hydrophobic and hydrophilic) surfaces, such as paraffin. [5,6].

IV. EXPERIMENTAL RESULTS

Here, the wetting ability of an aqueous solution is determined by the change in surface tension at the interface between the liquid and air.

We have studied the wetting ability of the cotton salt stock fatty acid sodium salt at the interface between water and air.

Figure 1 shows the change in this indicator depending on the concentration of sodium salt of cotton soap stock fatty acids.

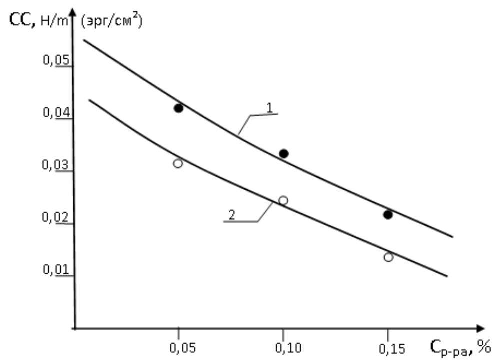

Fig. 1. Change in wetting ability (ss) of sodium oleate (curve 1) and sodium stearate (curve 2) depending on their concentration in aqueous solution

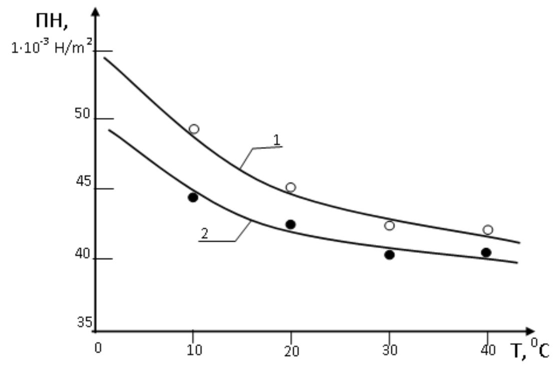

Fig. 2. Change in surface tension (bp) of a 0.1% aqueous solution of sodium oleate (curve 1) and sodium stearate (curve 2) depending on temperature

From Fig. 1.it is seen that the wetting ability, measured at 200 °C, is higher for sodium oleate than for sodium stearate.

In the studied range of surfactant concentrations in aqueous solutions, the wetting ability is described by a straight line. This is explained by the fact that selected surfactants dissolve well in an aqueous solution and their wetting ability is directly regulated at 200 °C. The advantage of such surfactants is that they wet hydrophobic substances at a surface tension of less than 0,5 N/m (55 erg/cm^2). Moreover, this indicator depends on many technological factors, which include temperature.

Given this, we studied the effect of the temperature of an aqueous solution on its surface tension.

From Fig. 2.it is seen that the surface tension (bp) of 0,1% aqueous solutions of sodium oleate (curve 1) and sodium stearate with an increase in temperature from 0 to 400 °C in both cases decreases exponentially. Moreover, a sharp decrease in surface tension for both sodium oleate and sodium stearate is observed at 200C. A further increase in temperature changes the surface tension of aqueous solutions with the addition of 0,01% of the studied surfactants

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relatively little. The surface activity of sodium oleate and sodium stearate determines their foaming, emulsifying, peptizing and other surfactants.

It is known that surfactant solutions are diphilic compounds and therefore they can be considered as polar compounds [7,8]. For example, with an increase in the molecular weight of soap-like surfactants, their hydrophobic properties increase. Their relationship with hydrophilic is reflected in the hydrophilic-hydrophobic balance (HLB). The association of fatty acid anions, formed by the mutual attraction of hydrocarbon radicals, which in the polar (water) solvent are oriented to the center of the miscella is oriented to the center of the miscella, forming the so-called Gartley micelles, having a spherical shape of the following form (Fig. 3.):

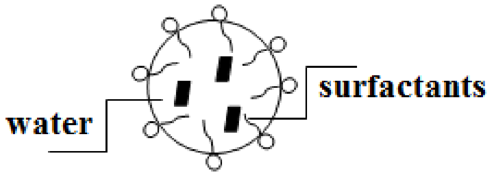

Fig. 3 Location of surfactants in aqueous solutions

It can be seen from Fig. 3 that solubilized hydrocarbon molecules can be located inside spheroidal miscells, while molecules of water-insoluble fatty alcohols are oriented by hydroxyl groups to water, and hydrocarbon radicals are oriented inside micelles. Hydrophilic substances insoluble in hydrocarbons, for example, sucrose, glycerin, can be adsorbed on the outer surface of spheroidal micelles.

Therefore, the combination of colloidal and molecularly dispersed properties of aqueous solutions of fatty acid surfactants is explained in the following: surfactant solutions are diphilic compounds, so all surfactants can be considered as polar compounds. Moreover, on the surface of micelles having a charge, counterions are oriented and double electric layers are formed. In this case, ionic micelles are strongly hydrated by water dipoles. Hence, the electric charge and hydration shell determine the aggregative stability of concentrated surfactant solutions, preventing the aggregation of micelles and their precipitation from the solution.

The critical micelle concentration (KKM) is considered to be a constant value for a given surfactant. However, potassium and sodium soaps with the same number of carbon atoms in the chain, although they have different solubilities in water, have the same KKM.

V. CONCLUSION AND FUTURE WORK

Thus, studies of the colloidal chemical properties of cotton soap stock fatty acids products show more potential for widespread use of such surfactants in various sectors of the economy. At the same time, it is necessary to increase their quality indicators, in particular color, due to the presence of gossypol, chlorophyll and their derivatives in them. Removing the latter from fatty acids makes it possible to obtain a lighter color surfactant than from cotton soap stock.

The results of the above analyzes of surfactants obtained on the basis of fatty acids show their multifunctional properties and areas of practical application.

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