

BASED ON FATTY ACIDS OF SYLVIC OIL SURFACTANTS: SYNTHESIS AND STUDY OF SURFACE ACTIVE CHARACTERISTICS

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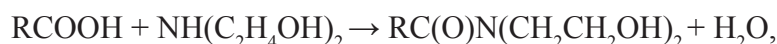
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Based on fatty acids of sylvic oil and ethanolamine based surfactants were synthesized, both non-ionic and cationic. Their characteristics were studied.

Keywords: non-ionic and cationic surface-active agents (surfactants), synthesis, characteristics

As of today surfactants has wide usage scope in many economic sectors: detergents, flotation reagents, emulsion and foam stabilizers, dispersants of minerals, antistatic agents, corrosion inhibitors, demulsification agents, etc.

The study objective is producing of surfactants from available and having the wide usage scope substances for organic synthesis:



where R is the rest of fatty acid.

Sylvic acid diethanol amide (SADA) was produced. Triethanolamine was used for production of cationic surfactant.



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Sylvic acid triethanolamine (SAT) was produced. It is a cationic surfactant.

Reaction control was performed by changing the acid number. At the end of process it was equal to 5,0-5,2 mg KOH/g for SADA and 5,5-5,8 mg KOH/g for SAT.

The duration of production process for SADA and SAT is 4-5 hours. Time & temperature mode of synthesis of SADA is presented at the Figure. Parameters of synthesis for SAT are the same as presented at the Figure.

The synthesized products at indoor temperature are brown viscous aggregations. The

from fatty acids of sylvic oil and from ethanolamines. Characteristics of synthesized surfactants are also studying.

Diethanol amine was used for production of non-ionic surfactant.

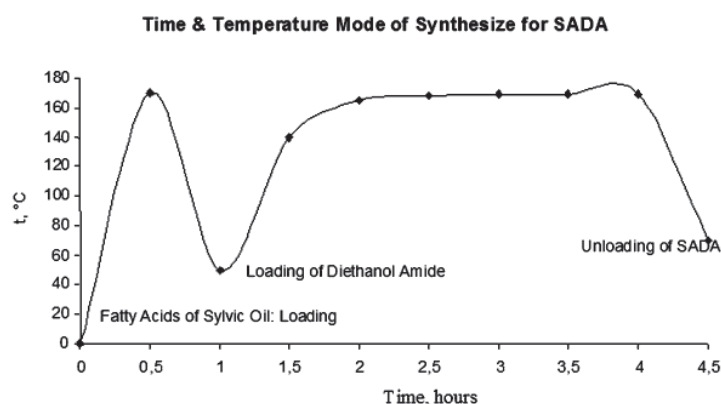
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structure of produced surfactant is corroborated by the findings of IR-spectroscopy.

During this study IR-spectrums were created in liquid film between the KBr plates using the instrument SPECORD 75 IR in the range 3800-700 cm^{-1} . These spectrums were interpreted: see [1] for additional information.

Thereby the findings of IR-spectroscopy corroborate the presence of characteristic functional groups in synthesized surfactant. The produced non-ionic surfactant is characterized by first and second amide lanes. The synthesized cationic surfactant contains hydroxyl, carboxylic, ester groups.



Time & Temperature Mode of Synthesize for SADA

Colloid-chemical characteristics of SADA and SAT were studied. Emulsifying, foam-production and other characteristics were estimated. Temperature of turbid formation for water solutions of non-ionic sur-

factants having the concentration 1 g/dm^3 was determined. Experimental and computed data relevant to study of characteristics of SADA and SAT solutions are presented in Table.

Characteristics of SADA and SAT Water Solutions

Characteristic	Value	
	SADA	SAT
HLB	12,625	11,68
CCMF, mole/dm ³	$3,7-3,8 \cdot 10^{-3}$	$3,1-3,2 \cdot 10^{-3}$
Temperature of turbid formation for water solution with concentration $1,0 \text{ g/dm}^3$, °C	82,0	-
Foam's ratio	0,048	0,030
Stability of emulsion pending 2 hours	Is stable	
pH of 1% water solution	6,5-7,0	7-8

Degree of adsorption on the surface for surfactants depends on structure of surfactants' molecules. Ratio between hydrophilic and hydrophobic shares (HLB) is the quantitative characteristic of surfactant's usage scope.

Turbid formation temperature (turbid point), HLB value and surfactant's usage scope are interrelated.

According to computed for SADA and SAT values of HLB the synthesized surfactants can be used as emulsifying agents «oil in water». These surfactants are easy soluble in water transparent dispersions. See [2] for additional information.

Reduce of surface tension is the basic estimation criterion of surfactant's action. See [3] for additional information. During this study the surface tension was measured according to tear of the ring procedure (for solutions). Construction of graphs for dependency between values of surface tension and values of concentration allowed determining the point of CCMF – the critical concentration of micelle formation. CCMF of SADA is equal to $3,7-3,8 \cdot 10^{-3} \text{ mole/dm}^3$, CCMF of SAT – $3,1-3,2 \cdot 10^{-3} \text{ mole/dm}^3$.

Turbid point has the practical meaning: stability of emulsion (containing surfactant as emulsifying agent) depends on temperature, at which emulsion was created. Temperature mode for creation of stable emulsion is determined by surfactant's turbid point. Temperature of creation for emulsion must not exceed the turbid point of surfactant's solution.

Average temperature of turbid point for synthesized SADA was equal to $82 \text{ }^\circ\text{C}$.

Ability to create foam is characterized by foam's ratio – ratio between volume of foam and volume of surfactant's solution. The foam's ratio was equal to 0,048 for SADA and

was equal to 0,030 for SAT. These values are small – this corroborates presence of non-ionic and cationic characteristics in synthesized products. These products are also characterized by relatively small foam producing ability.

The foam stabilizing ability is characterized by kinetic stability pending required period of time.

It is known, that stabilizing and emulsifying activities of surfactants are closely linked. They determine aggregative stability of emulsion – it is usually characterized by duration of existence (lifetime) for separate drops contacting each other or contacting with interfacial surface. This is also known as emulsion's delamination rate. The stability of produced emulsions was tested. The emulsions were diluted up to 0,5% of concentration and were shook energetically. No delamination was observed pending 2+ hours, so, the produced emulsions are stable.

Existence of various tensions between dispersed phase (oil) and dispersive medium (water) explains stabilizing activity of surfactant [4].

Presence of surface active characteristics (foam producing, wetting, emulsifying, stabilizing) for synthesized SADA and SAT is corroborated by the study findings.

References

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