STUDY OF THE "COMPOSITION-PROPERTY" DIAGRAM OF THE ACID ACETIC ACID MONOETHANOLAMMONIUM-UREA-WATER SYSTEM

[1]O.Kh.Panjiyev, [2]U.Kh.Panjiyev, [3]M. Abdurakhmanova
Candidate of technical sciences, associate professor of Karshi Engineering Economics Institute, Uzbekistan[1,2],
Master's student of Karshi Engineering Economics Institute, Uzbekistan[3]

ABSTRACT

This scientific article gives the information about creation of new liquid nitrogen fertilizers which containing plant stimulants by adding physiologically active substance to its composition on the basis of liquid urea-ammonium nitrate. And also it informs about the production of new liquid fertilizers with physiologically active substance on the basis of monoethanolamine urea ammonium nitrate.

Key words: Dioxide in carbon, ammonia, acetic acid, urea, water, carbamide, ammonium nitrate, urea-ammonium nitrate, monoethanolamine.

As a result of the priority program of industrial development in the Republic of Uzbekistan and the consistent implementation of sectoral programs for modernization, technical and technological renewal of production, the role of processing industries producing high value-added, competitive products is growing. Today, more than 78% of the industrial products which are produced in our country are accounted for by these industries.

Today, the experience of many developed and leading countries in the world economy proves that achieving competitiveness and access to world markets, first of all, can be carried out on account of the gradual reform of the economy, deepening structural change and diversification, providing the development intensively of new high-tech enterprises and industries, modernization of existing facilities and acceleration of the process of technical renewal.

In our country, the well-thought-out policy on optimizing the area under crops and zoning of agricultural crops has allowed to increase the production of other agricultural products several times, while maintaining a relatively stable volume of cotton, the most important raw material and export product.

One of the economical and consistent ways to develop the production of liquid complex fertilizers is the production of urea ammonium nitrate. Liquid complex fertilizers have a number of advantages over solid fertilizers: they do not dust, are not sticky, are freely readable, production technology and assembly of equipment are simple. The simplicity of placement of devices and the implementation of additional stages in the technological process (drying, evaporation, granulation) reduces the cost by 2-3 times compared to the process of obtaining granulated fertilizers. Achieving high economic performance of liquid complex fertilizers does not require the creation of large-capacity aggregates.

The application of physiologically active substances in a mixture of liquid complex fertilizers in the form of urea ammonium nitrate has an effective convenience.

One of the current problems in this research work is the organization of technology for obtaining effective modified liquid nitrogen fertilizers with physiologically active substances.

Monoethanolamine and its derivatives enhance the effect of active components in the composition of drugs, while simultaneously eliminating the side effects of drugs on the plant [2].

The study studied the effect of monoethanolamine on inorganic acids and its salts [3], as well as the results of the use of concentrated solutions of monoethanolamine and acetic acid at 20°C are adduced, but the effect of monoethanolamine on aqueous solutions of acetic acid was not studied.

The monoethanolamine-acetic acid-water system was studied to introduce the mechanism of action of acetic acid with monoethanolamine. As a result, a solid 1: 1 combination of monoethanolamine with acetic acid has separated.

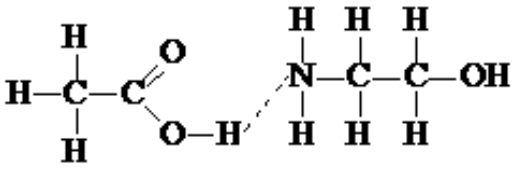
The isotherm of decomposition, density, viscosity, and environment pH indices characterizes the bending points corresponding to the 1: 1 and 1: 2 mole ratios of monoethanolamine-acetic acid. Thus, the resulting bending point indicates that two new compounds of 1: 1 and 1: 2 moles of monoethanolamine with acetic acid have been formed. In the isotherm, the pH of the medium is clearly expressed at the characteristic bending point.

In solid form, a single complex compound-starting components are separated by a 1: 1 ratio of sour acetic acid monoethanolammonium - $CH_3COOH•NH_2C_2H_4OH$.

Synthesized 1: 1 ratio monoethanolamine acetic acid sour acetic acid monoethanolammonium is a white crystalline substance.

Its empirical formula - $CH_3COOH·H_2NC_2H_4OH$

Its structural formula:



Molecular weight - M = 121.14

Liquidus temperature -750S

The following results were obtained by chemical analysis:

$HOC_2H_4NH_2$ CH3COOH

% mass, detected: 50,15; 48,67;

A mixture of liquid nitrogen fertilizers, 28-32% water (25.1%), concentrated solutions of ammonium nitrate (42.2%) and urea (32.7%) is called KAS [7]. The composition of the given KAS shows that the mass content of ammonium nitrate (ammonium nitrate) accounts for 40-44%. Liquid nitrogen fertilizers the inclusion of various chemical compounds consisting of physiologically active substance microelements in the composition of KAS increases its efficiency, depending on the quality and appearance. The literature review provided insights into the chemical effects of sour acetic acid monoethanolammonium, the main components of CAS — urea, ammonium nitrate, and their mixtures [$45\%CO(NH_2)_2+55\%NH_4NO_3$].

Accordingly, the interaction of components consisting of sour acetic acid monoethanolammonium, ammonium nitrate, urea in the system was studied, these results were applied to the physicochemical basis of the technology of obtaining liquid nitrogen fertilizers containing physiologically active substances.

The interaction of urea and monoethanolamine acids [4] and macro-, microcomponents of fertilizers, as well as compounds of monoethanolamine monocarboxylic acids which were widely used in industry and agriculture, were studied.

In order to determine the interaction of monoethanolammonium and urea with one-place sour acetic acid, the urea-one-place sour acetic acid monoethanolammonium-water system is investigated by the isomolar series method.

In the "Composition-property" diagram, it was studied that in the isotherm of this system (Fig. 6) refractive indices, density, viscosity of the solution were observed in 2 bends.

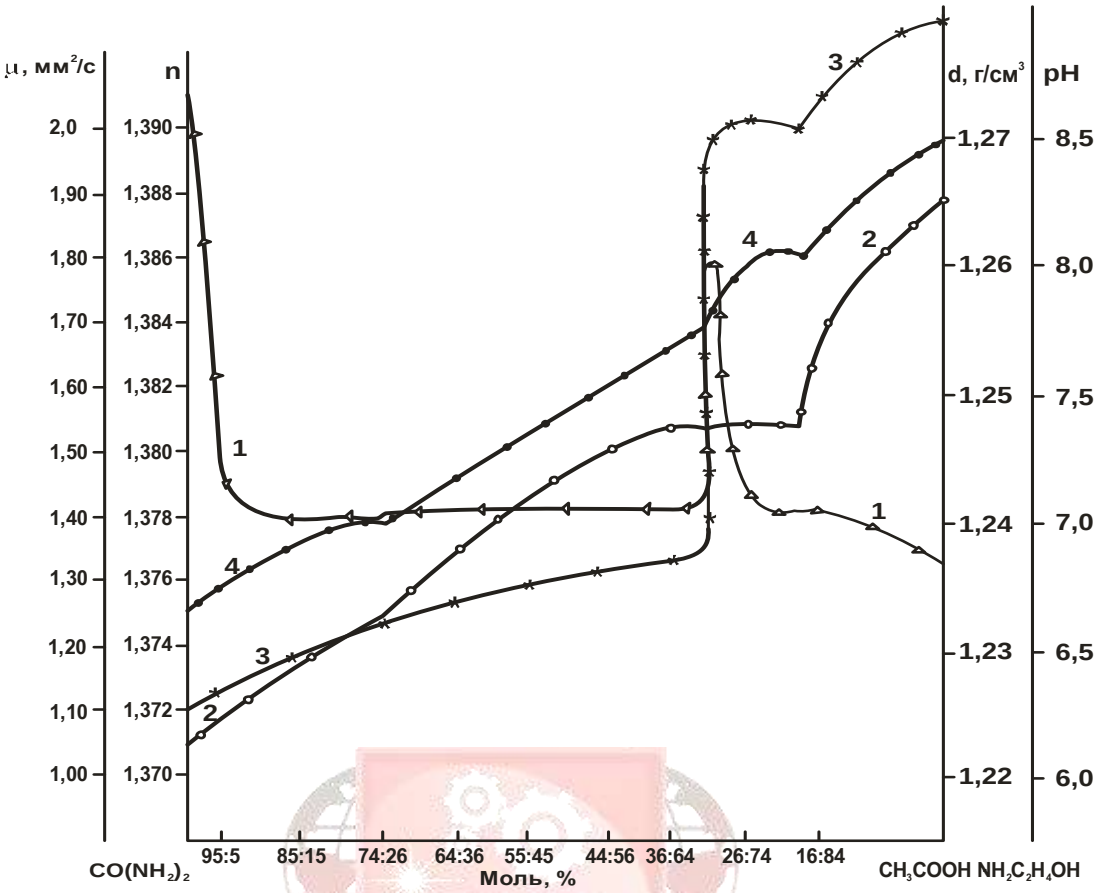


Figure 1. Urea-one-place sour acetic acid monoethanolammonium-water system.

(1) -rN environment; 2-viscosity; 3-density; 4-refractive indices.

The formation of a new phase in the given system was observed in the concentration range of 19,0–32,0% $CH_3COOH{\cdot}NH_2C_2H_4OH$ ва 81,0–68,0% and urea.

The new compound $CO(NH_2)_2{\cdot}CH_3COOH{\cdot}NH_2C_2H_4OH$ was solidly separated. Molecular weight M = 181.14. The liquefaction temperature was -143°C, the amount of base substance accounted for 98.0-99.6%.

Chemical analysis indicated the following results:

$(NH_2)_2{\cdot}CH_3COOH{\cdot}NH_2C_2H_4OH$

	$CO(NH_2)_2$	$CH_3COOH{\cdot}NH_2C_2H_4OH$
Detected, mass.%:	33,02	66,51
For the composition 1:1:1		
% mass.	33,12	66,88

Рентгенфазали анализ шуни кўрсатдики, олинган карбамид сирка кислотали моноэтаноламмоний ясси масофалар қиймати унинг индивидуаллигини характерлайди (2-расм)

X-ray phase analysis showed that the value of flat distances of monoethanolammonium acetic acid obtained characterizes its individuality (Figure 2)

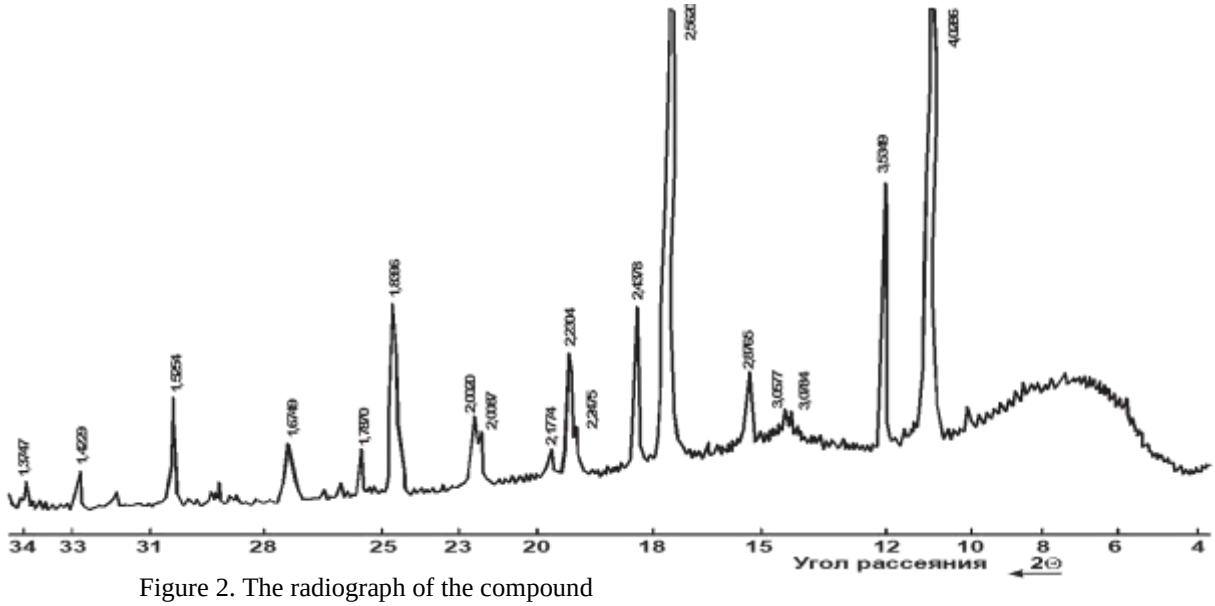


Figure 2. The radiograph of the compound

$CO(NH_2)_2 \cdot CH_3COOH \cdot NH_2C_2H_4OH$

The solubility of the isolated complex compound in organic solvents $CO(NH_2)_2 \cdot CH_3COOH \cdot NH_2C_2H_4OH$ was studied. It is soluble in alcohol, toluene, but it is insoluble in isoamyl alcohol and acetone. Its solubility at 0, 10, 20, 300°C is 20; 80; 87.8; 96.0% of the mass.

Three endothermic (143, 262, 398oS) and two exothermic (582, 722oS) effects were observed on the heating curve of the obtained compound. The first endo effect is based on the liquefaction of the salt, the second and third endoeffect is based on the separation of the substance with mass losses of 59.20 and 70.72% at temperatures of 262 and 3980S. The nature of the exoeffects 582 and 7220°C depends on the combustion and decomposition of thermolysis products (Figure 3).

Table 1.

The surface value of the compound $CH_3COOH \cdot NH_2C_2H_4OH$ и $CO(NH_2)_2 \cdot CH_3COOH \cdot H_2NC_2H_4OH$

One substitute is sour acetic acid monoethanolammonium (1:1) $CH_3COOH \cdot NH_2C_2H_4OH$		An urea compound of a substitute sour acetic acid monoethanolammonium (1:1:1) $CO(NH_2)_2 \cdot CH_3COOH \cdot H_2NC_2H_4OH$	
D, A	I/I_0, %	D, A	I/I_0 %
5,78	20,09	4,03	77,55
5,39	100	3,53	49,66
4,83	13,99	3,68	12,24
4,58	6,3	3,06	11,90
4,12	11,74	2,88	19,05
3,79	58,01	2,56	100
3,47	64,33	2,44	30,95
3,40	7,67	2,25	11,56
3,07	13,77	2,23	23,81
2,97	6,998	2,18	7,82

2,92	19,41	2,01	11,22
2,83	6,77	2,00	13,61
2,73	4,29	1,84	31,29
2,58	7,22	1,79	9,18
2,53	34,76	1,67	10,54
2,46	54,63	1,53	18,37
2,39	4,29,	1,42	7,14
2,36	10,38	1,38	5,44
2,28	8,58		
2,63	4,29		
2,22	6,09		
2,13	3,39		
2,05	7,22		
1,99	2,03		
1,947	6,3		
1,917	2,71		
1,881	2,93		
1,862	2,93		
1,807	6,03		
1,763	5,42		
1,733	3,39		
1,723	6,998		
1,693	5,87		
1,624	3,84		
1,594	2,48		
1,553	3,61		
1,505	1,13		
1,471	2,26		
1,381	1,81		

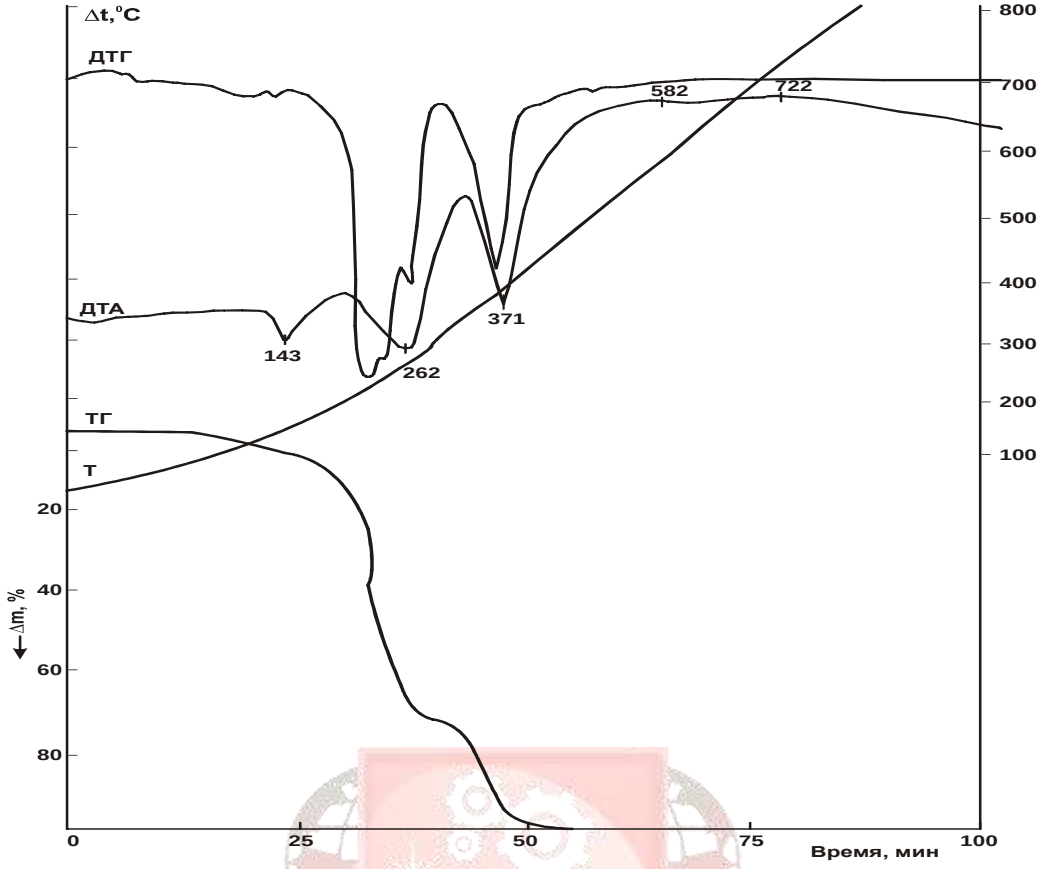


Figure 3. The derivatogram of the compound $CO(NH_2)_2 \cdot NH_2C_2H_4OH \cdot CH_3COOH$

The resulting acetic acid monoethanolammonium, monoethanolamine, urea in the IR spectral pathway (1580 cm-1) belongs to S = O, the urea molecule is located in the 1670 cm-1 section. Also, a complex branched path was observed in section 1670-1500 cm-1. The formation of urea acetic acid monoethanolammonium is directly related to the NH2 group when the compound CN3COON.H2NC2N4ON, located in the high-frequency section belonging to the C=O carboxylate group, is compared with the oscillation wave frequency.

REFERENCES

[1] Bergman A.G., Shulyak L.F. Политерма растворимости тройной системы вода-моноэтаноламин-мочевина // Journal неорг.химии. – Moscow, 1972. T.17 // №4 // pages 1146-1148.

[2] Shulyak L.F. Физико- химическое исследование четвертичной и тройных водных систем из нитратов аммония, калия, мочевины и моноэтаноламина. Автореф. дис. ... канд.хим.наук. // Новочеркаск.: 1974. // page 24

[3] Kazantseva M.I., Livchenko G.V. Система хлорид церия- хлорид этаноламина- вода при 25-50°C // Journal неорг.химии. – Moscow, 1977.T 22. // №7 –pages 2019-2021.

Alimova G.A., Saibova M.T., Prisekina L.P. О взаимодействии карбамида с минеральными кислотами // Journal неорган. химии. // Moscow 1982. T.27. // № 7. // Pages 1864 – 1867