STUDY OF RHEOLOGICAL PROPERTIES OF LIQUID CARBAMIDE-AMMONIA NITRATE SOLUTIONS

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Abstract: *Creation of new liquid nitrogen fertilizers based on liquid carbamide saltpeter with the addition of a physiologically active substance. Production of new liquid fertilizers with physiologically active substances based on monoethanolamine urea ammonium nitrate.*

Key words. *Carbon dioxide, ammonia, acetic acid, urea, water, urea, ammonium nitrate, urea ammonium nitrate, monoethanolamine.*

Depending on the physical and chemical properties and quantity of the specified compound, carbamide ammonium nitrate is 74.9% by mass, water with a crystallization temperature of -9.0°C is 25.1% by mass, density is 1.3010% g/sm^3; viscosity - 2,700 mm²/s and pN environment - 6.95% by weight of liquid nitrogen fertilizers based on carbamide-ammonium nitrate (KAS - 30%) increases the effectiveness of impact on agricultural crops. In order to determine the optimal ratio of components and consumption standards of liquid nitrogen fertilizers with a physiologically active substance, the solubility of the system was selected based on the diagram, and on the example of cotton, liquid nitrogen fertilizers based on sour acetic acid monoethanolammonium KAS (30%N) were tested.

According to the results of technological tests, the optimal amount of monoethanolammonium monoethanolammonium with one-place and two-place sour acetic acid was introduced as follows: the concentration of urea-ammonium nitrate is equal to 0.065 and 0.070%. Increasing or decreasing the content of sour acetic acid monoethanolammonium salt in liquid nitrogen fertilizers does not give agrochemical efficiency.

Depending on this requirement, liquid nitrogen fertilizers with the following mass ratio components are considered optimal: [74,9%$CO(NH_2)_2 \cdot NH_4NO_3$+25,1%$H_2O$] – sour vinegar acidic monoethanolammonium =1:0.00065,

[74,9%$CO(NH_2)_2 \cdot NH_4NO_3$+25,1%$H_2O$] – acid monoethanolammonium with disubstituted acid acetic acid =1:0.00070.

In order to obtain liquid nitrogen fertilizers with physiological activity [74,9%$CO(NH_2)_2 \cdot NH_4NO_3$+25,1%$H_2O$]–$SN_3COOH \cdot NH_2C_2H_4OH - H_2O$] system based on the solubility diagram, sour acetic acid monoethanolammonium (A content) it is advisable to dissolve in a 75.0% solution of ammonium nitrate (with N0 content) and urea.

It can be seen from the diagram that when the acid acetic acid monoethanolammonium (point A) is dissolved in 75% carbamide ammonium nitrate (point N0), the solubility of the system [45%$CO(NH_2)_2$+55%NH_4NO_3]-$NH_2C_2H_4OH \cdot CH_3NCOOH$-$H_2O$] in the diagram, the figurative point formed in solutions changes along the line "N_0 -A". The crystallization temperature of the initial solution consisting of ammonium nitrate and urea with a concentration of 75% was -9.7ºC. A solution of ammonium nitrate (N_0) settled in the saturation area of the system (Fig. 1).

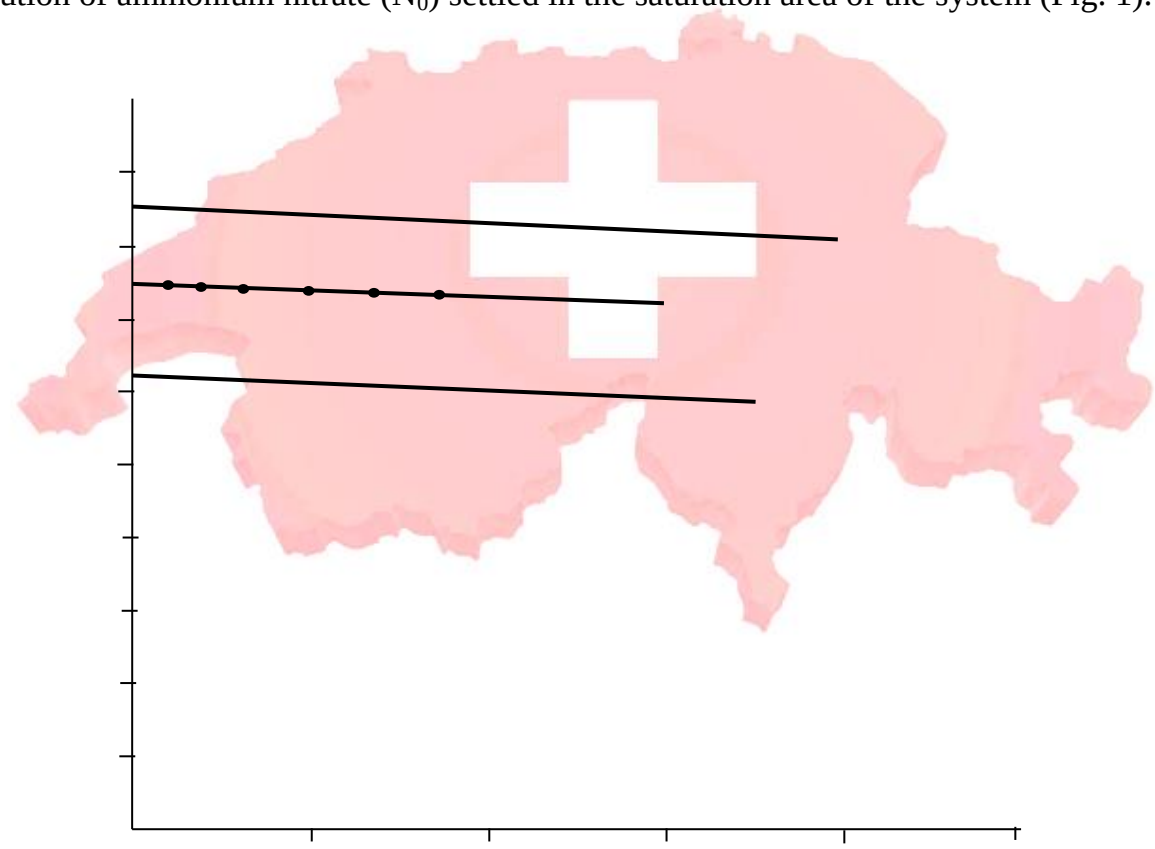

Figure 1. Solubility diagram for justifying the production process of liquid nitrogen fertilizers based on monoethanolammonium monoethanolammonium and urea ammonium nitrate, which is a substitute.

When monoethanolammonium is dissolved in monosubstituted acid acetic acid (point A), a solution containing N_0 is formed when the ratio "N_0:A" is equal to 1.0:0.00030. Urea ammonium nitrate is 74.96% in the solution when the N_0:A ratio is equal to 1.0:0.00050, monoethanolammonium monoethanolamine is 0.050%. The solution has a crystallization temperature of -9,83°C.

Then, in a 74.95% solution of urea and ammonium nitrate in the ratio "N_0:A" of 1.0:0.00065 at point "U" 0.065% monoethylammonium monoethanolamine and 24.985% water are formed. The crystallization temperature of the liquid product at point "U" is -9.90ºC, its figurative point is located in the crystallization section of ammonium nitrate. The density, viscosity, and crystallization temperature of the solutions depending on the composition (of monoethanolammonium monoethanolammonium nitrate and urea ammonium nitrate in the N_0:A ratio) are given in Table 1.

Table 1

Points of fertilizer composition	Composition of the solution, %			Crystal temperature °C	density, g/cm^3	viscosity mm^2/c	rN	S_o:Q ratio
	$CO(NH_2)_2$ NH_4NO_3	$SN_3COOH \cdot NH_2C_2H_4OH$	H_2O					
No	75,00	0	25,0	-9,7	1,301	2,700	6,95	-
N_1	74,97	0,03	25,000	-9,79	1,3000	2,705	6,95	1:0,00030
N_2	74,96	0,05	24,990	-9,83	1,2994	2,709	6,94	1:0,00050
Y	74,95	0,065	24,985	-9,90	1,2985	2,712	6,94	1:0,00065
N_3	74,92	0,10	24,980	-10,1	1,2983	2,715	6,93	1:0,00100
N_4	74,90	0,13	24,970	-10,3	1,2980	2,718	6,92	1:0,00130

N_5	74,88	0,153	24,962	-10,5	1,2976	2,721	6,92	1:0,00158

Correlation of density, viscosity and crystallization temperature of a solution consisting of monoethanolammonium acetic acid monoethanolammonium and urea-ammonium nitrate in the ratio "N_0:A" It was found that in the process of dissolving monoethanolammonium acetic acid, the rN of the environment, density, and crystallization temperature decrease simultaneously and the viscosity increases.

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