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SOLUBILITY ISOTHERM OF MANGANESE SULFATE - MONOETHANOLAMINE - WATER AT 10ºC

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Abstract:
Solubility isotherm of the system manganese sulfate - monoethanolamine - water at 10ºC consists of two branches of crystallization of the initial components. The first branch corresponds to crystallization in the solid phase of manganese sulfate penta-water, and the second corresponds to the new compound composition: NH2C2H4OH -MnSO4- 3H2O. The new compound was isolated in crystalline form and identified by methods of chemical, graphic and X-ray phase analysis. Preliminary agrochemical tests have shown that it increases the yield of cotton and grain crops by 3-7 c/ha and improves the quality of products.

Keywords: Isotherm, system, manganese sulfate, monoethanolamine, solubility, X-ray phase analysis, stimulant.

INTRODUCTION

The preparation of the base of ethanolamines, the components of mineral and microelements, beneficially influence the growth and development of plants, increase the nutrition of the basic elements, increase productivity and accelerate the ripening of various cultures.

V svyazi s etim issledovanie vzaimodeystviya ethanolaminov i ix proizvodnyx s sulfatami mikroelomov s polucheniem novyx vidov vysokoeffektivnyx ekologicheski bezvrednyx stimulyatorov rosta i razvitiya rastenii imeyut bolshoy teoricheskii i prakticheskii interes.

The early research and the obtained results are recommended in agricultural production with a positive side, and then the theory of further development and the practical application of physiologically active substances based on ethanolamines are more promising [1-3].

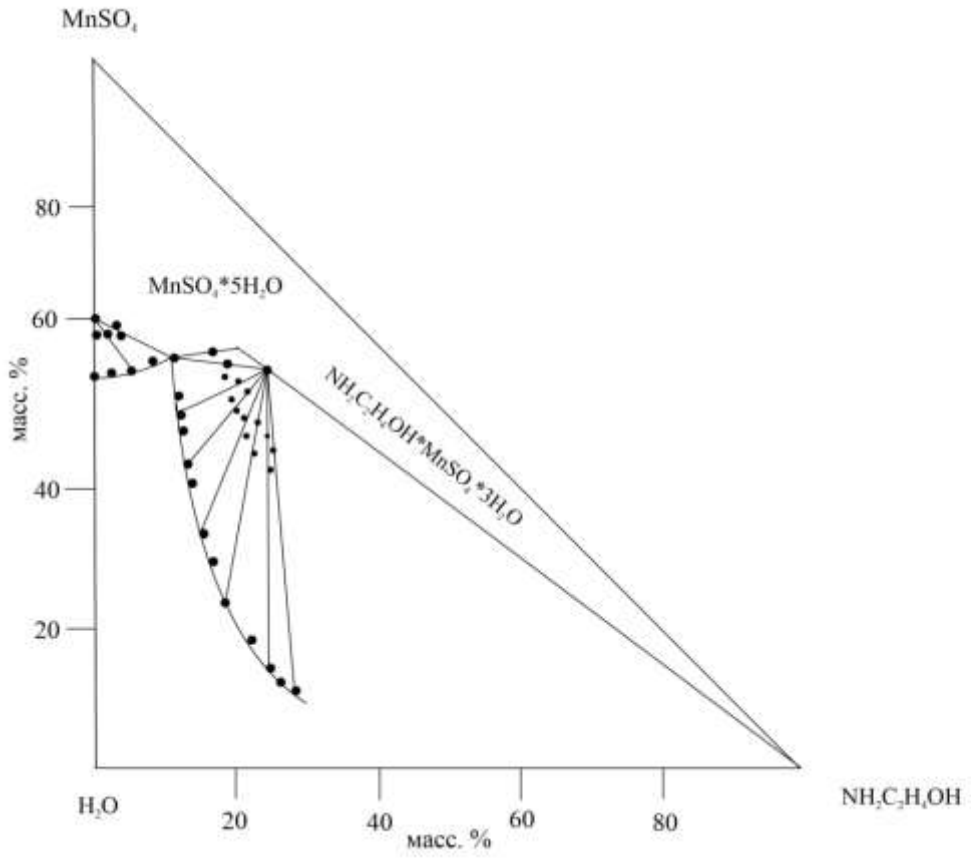
METHODOLOGY

Monoethanolamine specific titration with 0.1 N solution of sulfuric acid in the presence of methyl orange. Soderjanie SO4-2 is determined by the method of osijdeniya with subsequent pereschetom and sulfate metalla. [4-5].

Nitrogen-specific po method Keldalya [6].

MAIN PART

The investigated solubility and interaction in the system of sulfate manganese - monoethanolamine - water at a temperature of 10ºC showed that the equilibrium in the system was established in 7 cases. V kachestve iskhodnogo veshchestva ispolzovali perekristallizovannyu sol - sulfate manganese brand "xch" and monoethanolamine "ch" peregnannyy. The isotherm of the solution of the systemic sulfate of manganese - monoethanolamine - water is sostoit iz dvukh vetvey crystallization iskhodnykh komponentov. The first branch corresponds to the crystallisation of the solid phase sulfate of manganese pyativodnogo, and the second one opens the new soedineniyu composition: NH2C2H4ON·MnSO4·3H2O. Obrazovavsheesya soedinenie rastvoryaetsya v vode congruentno (fig. 1, table. 1).



Ris. 1. Isothermal solubility of systemic manganese sulfate -monoethanolamine - water pri 10ºC.

Konsentratsionnye predely sushchestvovaniya novogo soedineniya zanimayut na diagramme bolshuyu oblast i nakhodyatsya mejdu 12.69-28.50 % monoethanolamine i 8.72-59.86 sulfate manganese sootvetstvenno. Eto daet vozmojnost sintezirovat soedinenie v shirokikh predelax konsentratsiy iskhodnykh komponentov.

Novoe soedinenie vydeleno v kristallicheskom vide i identititsirovano metodami chemical, graphic, X-ray and thermal analysis.

Table 1

Soluble systemic manganese sulfate -monoethanolamine - water pri 10ºC

№	The composition is serious phase, mass %		Sostav tverdogo "ostatka", mass. %		Crystallizing phase
	МЭА	$MnSO_4$	МЭА	$MnSO_4$	
1	-	57,64	-	62,80	$MnSO_4 \cdot 5H_2O$
2	2,87	58,10	1,14	59,54	--//--
3	5,53	58,36	2,62	61,12	--//--
4	8,40	58,62	4,25	61,46	--//--
5	12,54	59,58	3,16	62,78	--//--
6	12,63	59,70	16,92	60,14	$MnSO_4 \cdot 5H_2O + NH_2C_2H_4OH$ $MnSO_4 \cdot 3H_2O$
7	12,69	59,86	19,18	57,89	$NH_2C_2H_4OH \cdot MnSO_4 \cdot 3H_2O$
8	12,58	55,42	18,20	56,41	--//--
9	12,51	51,82	19,90	55,33	--//--
10	12,75	48,81	19,29	53,58	--//--
11	13,10	43,56	20,45	53,54	--//--

12	15,21	39,90	20,16	51,60	--//--
13	16,39	34,33	20,94	50,22	--//--
14	18,30	30,11	21,12	47,49	--//--
15	19,26	24,80	22,08	50,77	--//--
16	22,32	20,39	22,36	45,44	--//--
17	24,10	15,23	23,29	47,63	--//--
18	26,41	12,18	24,48	41,52	--//--
19	28,50	8,72	24,60	45,80	--//--

Chemical analysis NH2C2H4OH·MnSO4·3H2O:
Vychesleno, % : Naydeno, % :
NH2C2H4OH – 22.93; NH2C2H4OH – 22.56;
MnSO4 – 56.77; MnSO4 – 56.98;
H2O - 20.30. H2O is 20.35.

X-rays of the original and synthesized new connection were recorded on the Dron-3 diffractometer with filtered copper, voltage 25 kV, current 8 mA, speed 2 degrees/min [7].

The X-ray phase analysis shows that the new connection occurs with the crystalline phase with individual sets of mejploskostnyx spacing and linear intensity (Table 2).

Table 2

Mejploskostnye rastoyaniya MnSO4·5H2O, NH2C2H4OH·MnSO4·3H2O

№	$MnSO_4 \cdot 5H_2O$				$NH_2C_2H_4OH \cdot MnSO_4 \cdot 3H_2O$			
	1	2	3	4	5	6	7	8
	d, Å	J/J₀	d, Å	J/J₀	d, Å	J/J₀	d, Å	J/J₀
1	7,66	10,96	1,634	15,85	11,30	79,331	1,854	27,59
2	4,91	60,98	1,616	18,29	7,35	31,03	1,833	34,48
3	3,82	14,63	1,598	9,76	6,02	51,72	1,799	34,48
4	3,50	100	1,577	8,54	4,91	34,48	1,774	37,93
5	3,37	42,68	1,537	8,54	4,37	31,03	1,701	34,48
6	3,14	62,195	1,482	12,195	4,54	48,28	1,674	37,93
7	2,58	47,56	1,424	6,097	3,79	37,93	1,659	41,38
8	2,42	9,76	1,301	10,96	3,70	58,62	1,571	41,38
9	2,36	18,29			3,06	100	1,537	41,38
10	2,25	23,17			3,00	89,66	1,463	27,59
11	2,14	15,85			2,82	41,38	1,344	27,59
12	2,10	17,07			2,60	27,59		
13	2,02	17,07			2,51	51,72		
14	1,972	9,76			2,42	44,83		
15	1,871	10,96			2,10	34,48		
16	1,747	9,76			2,01	34,48		
17	1,717	19,51			1,988	27,59		
18	1,675	9,76			1,967	27,59		

Osnovnye mejploskostnye rasstoyaniya sulfate manganese pyativodnogo imeyut znacheniya 4.91; 3.50; 3.14; 2.58; 2.25 Å s intensivnostyu 61, 100, 62, 48, 20 sootvetstvenno. For NH2C2H4OH · MnSO4 · 3H2O the following diffraction lines are characteristic: 11.30; 6.02; 4.54; 3.70; 3.06 Å s intensity 79; 52; 48; 59; 100 sootvetstvenno [8-9].

CONCLUSION

Provedennye physico-khimicheskie issledovaniya po izucheniyu zaimodeystviya i rastorimosti monoethanolamine s solyami mikroelomov, synthesis novykh soedineniy na ix osnove i vyavlenie ix effektivnosti v selskohozyaystvennom proizvodstve v kachestve stimulyatorov rosta i razvitiya rasteniya slujili osnovoy dlya razabotki tekhnologii polucheniya stimulyatorov rosta novogo pokolenia polyfunktsionalnogo deistviya.

As shown in the diagram, the issledovana rastvorimost v system manganese sulfate - monoethanolamine - water at 10oC. Ustanovleno obrazovanie novogo soedinenia NH2C2H4ON·MnSO4·3H2O, which was identified by methods of chemical, graphic and X-ray phase analysis. Predvaritelnye agrokhimicheskie spytaniya showed that it increases the yield of klopchatnika and grain culture by 3-7 ts/ha and increases the quality of the product.

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