SOLUBILITY IN THE SYSTEM SODIUM CHLORATE - RHODANIDE AMMONIUM – WATER

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Abstract: *the article presents data on the solubility of the components in the sodium chlorate – ammonium rhodanide – water system, which was studied by the visual-polythermal method in the temperature range from (-29.9 ° C) to 80 ° C. The results of the study of sodium chlorate - ammonium rhodanide - water can be used for the production of rhodanite containing defoliants, as the article provides the ratios of components at which the salting out of ammonium rhodanide in aqueous medium in the presence of sodium chlorate occurs.*
Keywords: *heterogeneous phase equilibria, solubility diagram, defoliants, desiccants, crystallization.*

РАСТВОРИМОСТЬ В СИСТЕМЕ ХЛОРАТ НАТРИЯ - РОДАНИД АММОНИЯ – ВОДА

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Аннотация: *в статье приведены данные по растворимости компонентов в системе хлорат натрия - роданид аммония – вода, изученной визуально-политермическим методом в температурном интервале от -29,9^{o}C до 80 ^{o}C. Полученные результаты исследования хлорат натрия - роданид аммония - вода можно использовать для производства роданит содержащих дефолиантов, так как в статье приводятся соотношения компонентов, при которых происходит минимальное высаливание роданида аммония в водной среде в присутствии хлората натрия.*
Ключевые слова: *гетерогенные фазовые равновесия, диаграмма растворимости, дефолианты, десиканты, кристаллизация.*

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Sodium chlorate is one of the widespread defoliants - desiccants of inorganic origin [1]. The main disadvantages of it is the lack of efficiency and "rigidity" of the action on plants. The introduction of various nitrogen-containing compounds into sodium chlorate leads to an increase in the defoliating activity and a decrease in its negative effect on plants [2, 3].

In this regard, to clarify the behavior of sodium chlorate and ammonium rhodanide with their joint presence and substantiate the process of obtaining effective defoliants based on them, the solubility in the sodium chlorate – ammonium rhodanide – water system was studied by the visual-polythermal method [4].

For the study, sodium chlorate and ammonium rhodanide of qualification "h" were used, which were additionally purified by recrystallization from water.

The binary systems of ammonium rhodanide — water and sodium chlorate — water, have been studied by a number of authors [5, 6]. Our findings are in good agreement with the literature.

The sodium chlorate – ammonium rhodanide – water solubility system was studied using nine internal cuts: sections I – II were drawn from the side of sodium chlorate – water to the top of ammonium rhodanide, and III – IX from the side of ammonium rodanide to water to the top of $NaClO_3$.

Based on the data of binary systems polytherm and internal sections, a polythermic solubility diagram of the $NaClO_3$-NH_4SCN-H_2O system from –29.9 (complete freezing of the system) to 800 ° C (figure) is constructed, on which the crystallization fields of ice, chlorate and ammonium and sodium rohanide are separated. These fields converge at four nodal nonvariant points of the joint existence of three different solid phases, for which crystallization temperatures and compositions of the equilibrium solution are established.

Table 1. Double and triple nodal points of the system $NaClO_3$-NH_4SCN-H_2O

The composition of the liquid phase, %			**Crystallization temperature, ^0C**	**Solid phas**
NH_4SCN	**$NaClO_3$**	**H_2O**		
1	**2**	**3**	**4**	**5**
	42,0	52,1	-18,5	Ice + $NaClO_3$
3,4	41,2	55,4	-21,9	Ice + $NaClO_3$+NH_4ClO_3
4,2	38,4	57,4	-20,4	Ice + NH_4ClO_3
7,0	29,6	63,4	-14,8	То же
15,8	15,6	68,6	-13,2	То же
17,1	10,8	72,1	-14,4	То же
42,2		57,8	-25,3	Ice + NH_4SCN
44	5,6	50,4	-29,9	Ice + NH_4SCN+ NH_4ClO_3
53,6	8,4	62	23,6	NH_4SCN + NH_4ClO_3
54,5	9,2	36,3	26	Also
56,4	16	27,6	34	NH_4ClO_3 + NaSCN +NH_4SCN
60,4	14	25,6	37	NaSCN + NH_4SCN
74,3	6,8	18,9	52,4	Also
83,1	3,6	13,3	69,8	Also
56,4	17,5	26,1	35,6	NH_4ClO_3 + NaSCN
56,0	19,8	24,2	38,0	Also
55,8	21,2	23	39,2	$NaClO_3$ + NH_4ClO_3 + NaSCN
61,4	22,8	15,8	56,8	$NaClO_3$ + NaSCN
64,8	24,8	10,4	74,0	Also
5,8	41,7	52,5	-1,6	$NaClO_3$ + NH_4ClO_3
11,6	42,4	56	21,6	Also
24,5	38,8	36,7	49	Also
40,8	32,0	27,2	62,0	Also
51,0	27,2	21,8	54,0	Also
37,5	6,4	56,1	-25,2	Ice + NH_4ClO_3

As can be seen from the above data, in the studied system, ammonium chlorate and sodium rhodanide are formed as new phases.

The crystallization fields of the sodium and ammonium rhodanide salts occupy a smaller part of the polythermal diagram than the crystallization fields of sodium and ammonium chlorates. This indicates a good solubility in this system of sodium and ammonium rhodanides compared with their chlorates [7].

From the results of the study of the solubility of the components of the $NaClO_3$-NH_4SCN-H_2O system, it follows that exchange reactions between the components of the system occur in an aqueous medium with the formation of ammonium chlorate and sodium rohanide. Therefore, it should be expected that the combined use of defoliation of sodium chlorate with ammonium rhodanide leads to an increase in the defoliating activity due to the formation of more active ammonium chlorates [8].

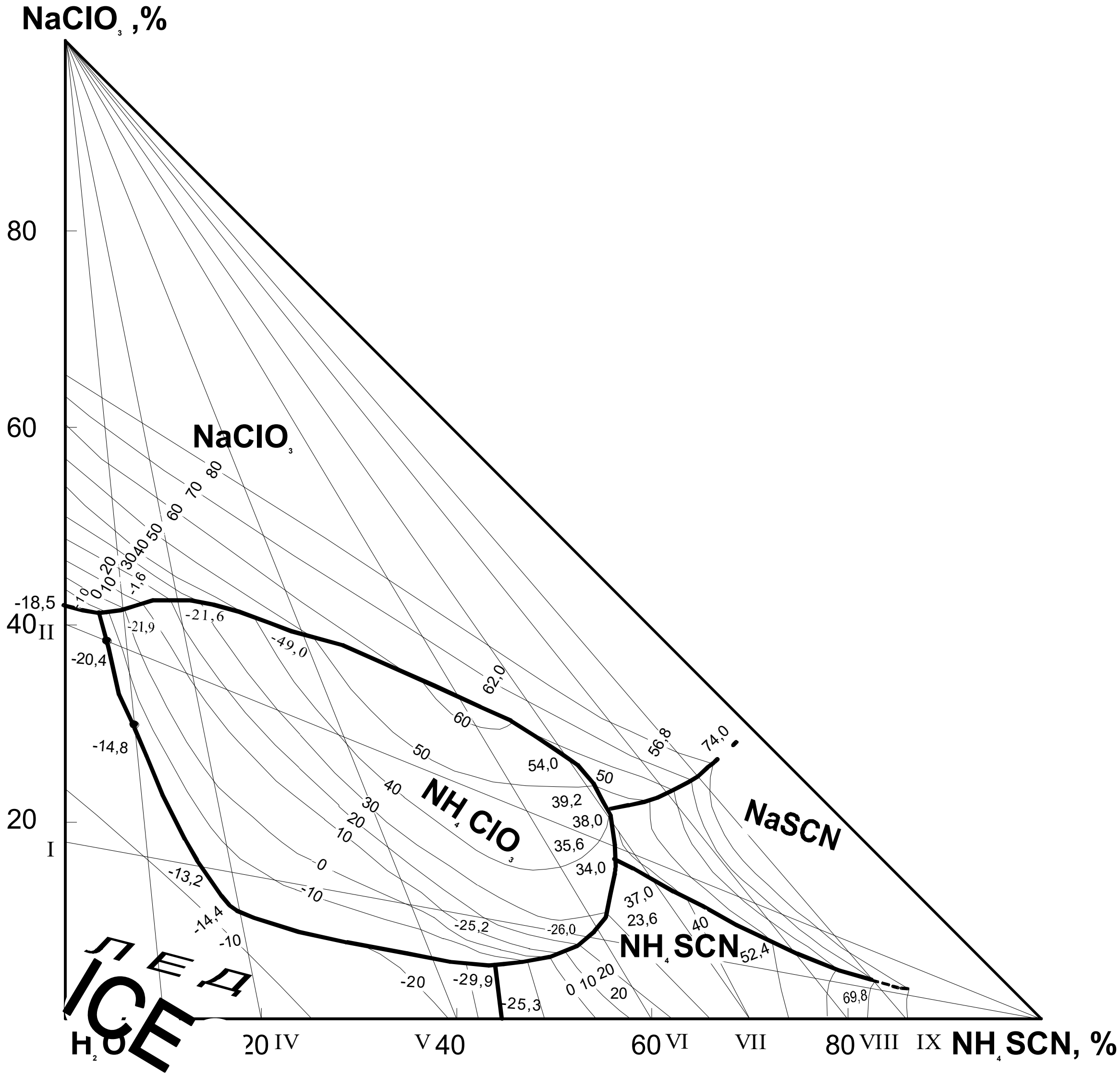

Fig. 1. Polythermic solubility diagram of the $NaClO_3$-NH_4SCN-H_2O system

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