

CALCIUM CHLORATE IS BASED ON SODIUM CHLORATE AND CALCIUM CHLORATE STUDY OF WATER SYSTEMS

Omonbayeva Gulzoda Botirjon qizi

Assistant, Fergana Polytechnic Institute, Fergana, Uzbekistan

E-mail: gulzoda.omonbayeva@ferpi.uz

ABSTRACT	KEY WORDS
In this regard, we studied this system in a very political-political way. Liquidity lines of ice and calcium chlorate with different levels of hydration were determined in the water solubility curve of calcium chlorate. In the solubility curve of the calcium chlorate–water system, ice formation continues to 46.1% of calcium chlorate at -40.300C (eutectic). From this point, calcium chlorate hexahydrate, stable to -27.2°C, crystallizes. The temperature range of -27.2°C -6.8°C corresponds to the crystallization zone of tetrahydrous calcium chlorate.	Bischofite, calcium-magnesium chlorate, solubility, diagram, binary systems, ice, crystallize, sodium chlorate.

Introduction

The main promising ways for the development of agriculture in the world are the introduction of new technologies of soil cultivation, the creation of high-yielding varieties of technical plants, and at the same time mineral fertilizers, plant growth stimulants, pesticides, including depends on the complex use of defoliants [1-3]. Chlorate-containing defoliants belong to the category of low-toxic drugs in terms of production and use. But for the production of magnesium chlorate defoliant, 50% of the raw material is used "bischofite", which is bought from abroad for foreign currency [4-7]. As one of the effective ways to solve this problem, scientific staff of the Institute of General and Inorganic chemistry of the Russian Federation used "Sho'rsuv" and "Pachkamir" dolomites instead of "bishofite" raw materials, using raw materials that were decomposed with hydrochloric acid a new calcium-magnesium chlorate defoliant production technology was implemented. For the physico-chemical justification of the defoliant process, it is necessary to know that the components of the calcium defoliant chlorate $\text{Ca}(\text{ClO}_3)_2\text{-CaCl}_2\text{-H}_2\text{O}$ system, concentrated in the active substance, work in a wide temperature and concentration range [8-11].

Materials and Methods

The binary system calcium chloride-water has been studied at temperatures from freezing to 100. The water solubility curve of calcium chloride in the studied temperature range consists of four branches of crystallization of solid phases: ice, hexahydrate, tetrahydrate and dihydrate calcium chloride..

The obtained data are in good agreement with the literature on the state of the eutectic points and the presence of calcium chlorate and calcium chloride crystalhydrates [12-17].

Solubility in the $\text{Ca}(\text{ClO}_3)_2\text{-CaCl}_2\text{-H}_2\text{O}$ system was studied with eight internal sections. Based on the obtained solubility data for binary systems and internal sections, a polythermal diagram of the solubility of the $\text{Ca}(\text{ClO}_3)_2\text{-CaCl}_2\text{-H}_2\text{O}$ system from the eutectic freezing point (-69.20°C) to 100°C was constructed [18-20].

The polythermal diagram of solubility of the studied system consists of seven crystallization zones of solid phases: ice, $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$; $\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$; $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$; $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$; $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$; $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$. fields converge at the five three-way nonvariant nodes of the joint phases existence of three different solid phases. The characteristics of two and three points are given in the table below.

Table 1. Two and three points of the $\text{Ca}(\text{ClO}_3)_2\text{-CaCl}_2\text{-H}_2\text{O}$ system

Composition of liquid phase. %			$t_{\text{kr}}, ^\circ\text{C}$	Solid phase
$\text{Ca}(\text{ClO}_3)_2$	CaCl_2	H_2O		
1	2	3	4	5
-	30,6	69,4	-49,7	Ice+ $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
13,0	26,1	60,9	-51,6	Ice+ $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
15,2	25,1	59,7	-52,4	Ice+ $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
34,0	15,2	50,8	-59,5	Ice+ $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
44,4	3,2	52,4	-69,2	Ice+ $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
46,1	-	53,9	-40,3	Ice+ $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$
50,9	2,0	47,1	-38,0	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$
54,0	1,2	44,8	-29,6	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$;
55,0	-	45,0	-27,2	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$
59,5	0,9	39,6	-12,0	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
60,0	1,1	38,9	-11,2	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
60,6	1,0	38,4	-9,6	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$;
61,2	0,9	37,9	-8,4	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
62,0	-	38,0	-6,8	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$
68,3	2,6	29,1	39,5	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
71,7	4,8	23,5	84,0	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
76,0	5,6	18,4	100	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
57,1	4,7	38,2	-8,5	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
45,9	16,4	37,7	2,1	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
43,4	20,6	36,0	4,5	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
27,5	31,0	41,5	14,5	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
22,0	33,0	45,0	18,0	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
11,6	42,0	46,4	23,6	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
-	50,1	49,9	29,7	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$
54,8	8,3	36,9	-4,0	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
48,9	15,4	35,7	2,4	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
39,0	25,4	35,6	11,6	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
34,0	29,6	36,4	16,0	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
25,2	36,8	38,0	24,0	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
10,5	47,7	41,8	36,3	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
-	56,6	43,4	45,4	$\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ + $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$

Solubility of $\text{Ca}(\text{ClO}_3)_2$ in $2\text{-NaClO}_3\text{-H}_2\text{O}$ system with calcium chlorate-sodium chlorate-water rhennium sections. Cuts I-VI are water to the top of the calcium chlorate-sodium chlorate made from the side, and water to the sodium chlorate-calcium chlorate pole from the VII side. Based on the solubility data of binary systems and internal sections, a polythermal diagram of the solubility of the $\text{Ca}(\text{ClO}_3)_2\text{-NaClO}_3\text{-H}_2\text{O}$ system from the eutectic freezing point (-41.60°C) to 100°C was compiled (Fig. 1.).

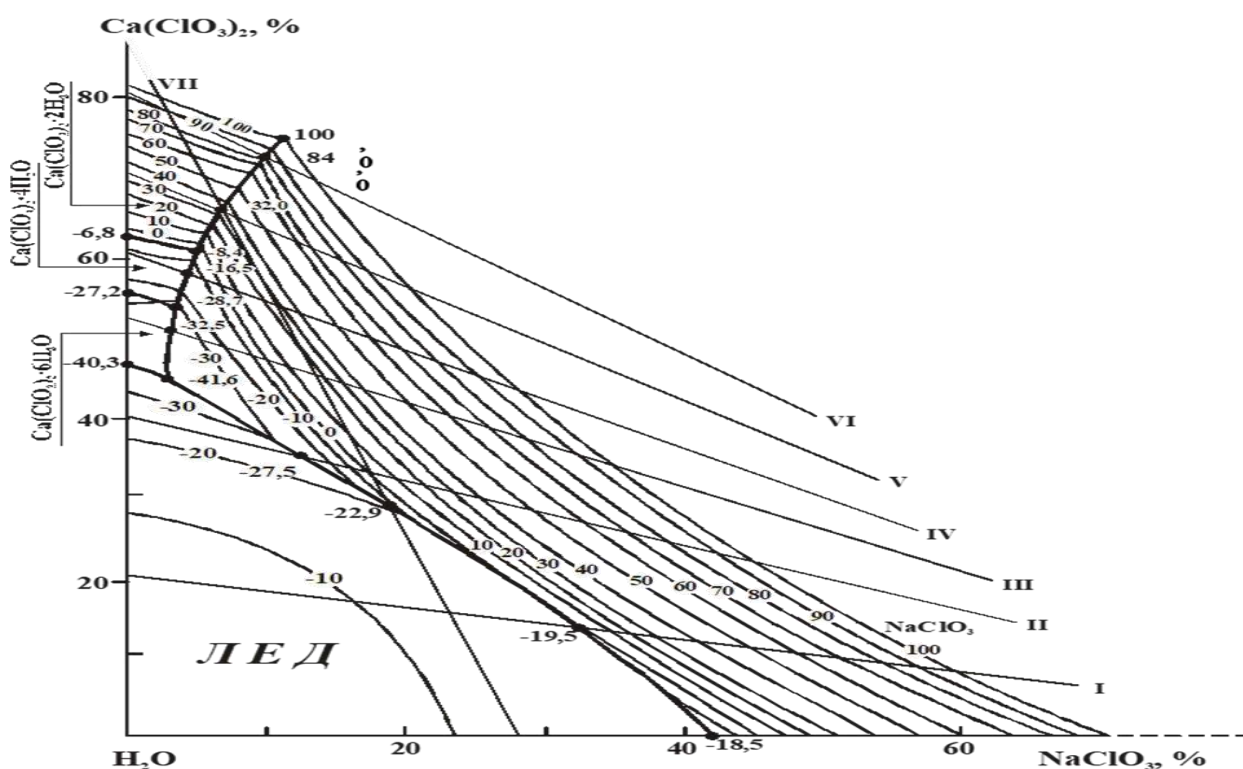


Figure 1. Polythermal diagram of the solubility of the system

The polythermal diagram of solubility of the studied system consists of five crystallization areas of solid phases: ice, NaClO_3 , $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$; $\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ and $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$. fields converge at the three triple nonvariant nodal points of the coexistence of three different solid phases.

The characteristics of two and three points are presented in Table 2.

Table 2. Two and three points of the $\text{Ca}(\text{ClO}_3)_2$ - CaCl_2 - H_2O system

Composition of liquid phase., %			T. kr.°C	Solid phaza
NaClO_3	$\text{Ca}(\text{ClO}_3)_2$	H_2O		
41,9	-	58,1	-18,5	Ice + NaClO_3
32,4	13,5	54,1	-19,5	Ice + NaClO_3
19,0	28,4	52,6	-22,9	Ice + NaClO_3
11,9	35,1	53,0	-27,5	Ice + NaClO_3
2,7	44,4	52,9	-41,6	Ice + $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + NaClO_3
-	46,1	53,9	-40,3	Ice + $\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$
3,0	50,4	46,6	-32,5	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + NaClO_3
3,4	53,3	43,3	-28,7	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + NaClO_3
-	55,0	45,0	-27,2	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$
4,3	57,4	38,3	-16,5	$\text{Ca}(\text{ClO}_3)_2 \cdot 6\text{H}_2\text{O}$ + NaClO_3
4,8	60,4	34,8	-8,4	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + NaClO_3
-	62,0	38,0	-6,8	$\text{Ca}(\text{ClO}_3)_2 \cdot 4\text{H}_2\text{O}$ + $\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$
6,3	65,2	28,2	32,0	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + NaClO_3
9,8	72,0	18,2	84,0	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + NaClO_3
11,1	74,0	14,9	100	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$ + NaClO_3

The polythermal state diagram draws isothermal solubility curves every 10 in the temperature range -30÷1000C. Calcium chlorate-water and sodium chlorate-water polytherm projections are built on the sides of the system.

The results of the study show that no new compounds or solid solutions based on the initial components are formed in the system in the studied temperature range. The system is simple eutonic. In the temperature range -18.5°C -41.6°C, ice crystallizes together with sodium chlorate from the equilibrium solution in the system, and ice with hexahydrate calcium chlorate at -41.6°C -40.3°C, temperature range -41.6°C -28.7°C corresponds to the co-crystallization of calcium chlorate hexahydrate with sodium chlorate. Calcium chlorate tetrahydrate and sodium chlorate co-crystallize from an equilibrium solution at -28.7°C -8.4°C.

References

1. Курбанов, Ж. Х., Давлятова, З. М., Эргашев, А. А. Ё., Абролов, А. А., & Омонбаева, Г. Б. К. (2019). Интенсивность теплообмена при нагреве раствора $\text{nh}_2\text{coonh}_4$ в теплообменнике с высокоэффективными трубами. *Universum: технические науки*, (12-2 (69)), 24-27.
2. Usmanov, B., & Amanbayeva, G. (2022). Изучение растворимости трикальцийфосфата в водных растворах нитрата аммония. *Nazariy va amaliy tadqiqotlar xalqaro jurnali*, 2(11), 63-71.

3. Usmanov, B., & Amanbayeva, G. (2022). Переработка фосфоритов центральных кызылкумов на одинарные и комплексные удобрения. *Nazariy va amaliy tadqiqotlar xalqaro jurnali*, 2(10), 175-183.
4. Усманов, Б. С., & Кодиров, З. З. (2021). Влияние солнечных лучей на состав продуктов при хранении высококачественных растительных масел. *Universum: технические науки*, (2-2 (83)), 92-95.
5. Usmanov, B., & Umurzakova, S. (2021). Investigation of the chemical composition and properties of low-grade phosphorites of tashkur. *Innovative Technologica: Methodical Research Journal*, 2(12), 100-105.
6. Усманов, Б. С., Гоппиржонович, К. М., Сайтбековна, К. У., & Умурзакова, Ш. М. (2019). Особенности состава и свойств сафлорового соапстока, определяющие области его применения. *Universum: технические науки*, (12-3 (69)), 18-20.
7. Усманов, Б. С., Медатов, Р. Х., & Мамажонов, И. Р. (2019). Интенсификация теплообмена при течении HNO_3 в трубах с кольцевыми турбулизаторами. *Universum: технические науки*, (10-2 (67)), 35-37.
8. Усманов, Б. С., Кодиров, З. З., & Ибрагимов, Л. А. (2021). Способы использования высокочастотных лучей при длительном хранении сырья для производства растительных масел. *Universum: технические науки*, (5-3 (86)), 93-96.
9. Мирзаев, А. Н., Рахмонов, Д., & Буриева, З. Р. (2022). Влияния Режимных Параметров На Степень Очистки В Двухступенчатом Аппарате. *Central Asian Journal of Theoretical and Applied Science*, 3(5), 10-14.
10. Юлдашев К., Мансуров Ю.Н., Джураев А.И., Мирзаев Н.А. (2021). Современный катализатор на основе оксида церия. *ISJ Теоретические и прикладные науки*, 11 (103), 940.
11. Хамдамова, Ш. Ш., & Мирзаев, Н. А. (2020). Взаимодействие компонентов в системе $\text{Mg}(\text{ClO}_3)_2$ - $\text{n}(\text{C}_2\text{H}_4\text{OH})_3\text{-H}_2\text{O}$. *Universum: химия и биология*, (1 (67)), 26-31.
12. Dilmurod, E., Navruzbeq, M., & Oybek, E. (2022). The effect of efficient development developments on efficiency. *Universum: технические науки*, (12-7 (105)), 49-53.
13. Khurramatov, A. M., Mirzayev, N. A., & Ibragimov, F. A. (2023). Results of optimizing the process of cleaning air from solid particles. *International Journal of Advance Scientific Research*, 3(06), 217-225.
14. Мейлиева, Л. К., Давлятова, З. М., & Кадиров, Х. И. (2021). Изучение антикоррозионных свойств продуктов переработки отходов полиэтилентерефталата. *Universum: технические науки*, (8-2 (89)), 52-57.
15. Курбанов, Ж. Х., Давлятова, З. М., Эргашев, А. А. Ё., Абролов, А. А., & Омонбаева, Г. Б. К. (2019). Интенсивность теплообмена при нагреве раствора $\text{nh}_2\text{coonh}_4$ в теплообменнике с высокоэффективными трубами. *Universum: технические науки*, (12-2 (69)), 24-27.
16. Усманова, Ю. Ш., Давлятова, З. М., & Кадиров, Х. И. (2021). Получение этилендиамина на основе отработанного моноэтаноламина. *Universum: технические науки*, (9-2 (90)), 40-44.
17. Ортикова, С. С., Жураев, А. И. У., & Нурматова, З. Н. К. (2019). Исследование водонерастворимой части аммофосфата на основе фосфорнокислотной переработки забалансовой фосфоритной руды Центральных Кызылкумов. *Universum: химия и биология*, (12 (66)), 59-61.

18. Saidmambievna, O. S., & Sattarovich, N. S. (2018). Composition and physicochemical properties of nitrogen-phosphorus-sulphur-calcium containing fertilizers. *Austrian Journal of Technical and Natural Sciences*, (7-8), 50-54.
19. Alimov, U. K., Ortikova, S. S., Abasov, X. K., & Namazov Sh, S. (2015). Ammophosphate based on partially ammoniated wet-processing phosphoric acid and off-balance from Central Kyzylkum phosphorite. *Khimicheskiy Jurnal Kazaxstana [Chemical Journal of Kazakhstan]*, (5), 12-18.
20. Жаббаргенов, М. Ж., Маденов, Б. Д., Ортикова, С. С., Сейтназаров, А. Р., & Каймакова, Д. А. (2021). Улучшение качества аммофосфатного удобрения из низкосортного фосфатного сырья. *Universum: технические науки*, (2-2 (83)), 69-76.