British Journal of Global Ecology and Sustainable Development
Volume-28, May - 2024
ISSN (E): 2754-9291

OBTAINING LIQUID COMPLEX FERTILIZERS BASED ON FERGHANA DOLOMITE “SHORSU”

Saidullaeva Gulnoz Anorboevna
Assistant Teacher of the Tashkent Medical Academy
gulnozmaxammatova 93@ gmail . com . + 998(97) 706-60-98

Abstract

Currently, much attention is paid to the production of complex liquid fertilizers containing N, Ca, P_2O_5, K_2O, as well as plant protection products , physiologically active substances , insecticides , etc. etc. The production of such complex fertilizers ensures significant savings in costs associated with transportation , storage of fertilizers and the introduction of chemicals. Of great interest is the study of the combined use of liquid fertilizers with physiologically active substances that help accelerate the growth and development of plants and obtain effective yields.

An integral part of measures to increase the productivity of agricultural crops is the use of microelements, since the use of only mineral and organomineral fertilizers is not enough for the normal development of plants .

Therefore, this article is devoted to scientific research on the production of liquid fertilizers containing, in addition to N , Ca , Mg , K_2O , also physiologically active substances and microelements

Key words: complex, physiologically active substance, microelements, composition-properties, diagram, solution, dolomite

Introduction

To develop a technology for producing complex liquid fertilizer based on the products of nitric acid decomposition of dolomite at the Shorsu mine , it is necessary to study the decomposition process depending on the acid concentration and temperature.

For this purpose, solutions of nitric acid of 20, 30, 40, 57 % concentration were used. The experiments were carried out in a thermostated three-mountain glass reactor at temperatures of 20, 30, 40, 50 and 60°C. The calculated amount of crushed dolomite was immersed in the reactor, and then the calculated amount of nitric acid was gradually poured in at 100% stoichiometry. 30 minutes after the end of the decomposition process, the CaO content was determined and MgO in solution using the complexometric method of analysis [5] and the degree of extraction of CaO and MgO into the solution was calculated.

The results of the experimental data are shown in Table 2.

Table 2 Dependence of the degree of extraction of CaO and MgO into solution on temperature and concentration of nitric acid

Temperature, °C	Nitric acid concentration, %							
	20		thirty		40		57	
	Degree of extraction into solution, %							
	CaO	MgO	CaO	MgO	CaO	MgO	CaO	MgO
20	68.53	70.14	81.30	82.42	89.3	90.42	89.29	91.33
thirty	70.74	71.23	88.32	89.61	97.3	89.42	97.41	98.50
40	71.38	72.08	89.34	90.48	98.54	99.0	98.62	99.23
50	72.04	72.56	90.28	91.39	98.82	99.35	98.90	99.47
60	72.58	73.17	91.34	91.97	99.24	99.46	99.31	99.56

Table 2 shows the results of experimental data on the influence of acid concentration and temperature on the degree of extraction of calcium and magnesium oxides into solution. The table shows that during the decomposition of dolomite with 20% nitric acid, as the process temperature increases from 20 to 60°C, the degree of extraction of CaO is 68.53÷72.58%, MgO 70.14÷73.17%. When decomposing dolomite with 30% HNO_3, the degree of extraction of CaO and MgO was 81.3÷91.34% and 82.44÷91.97%, respectively.

The decomposition of dolomite with 40% acid contributed to 89.3÷99.24% extraction of CaO into the solution and 90.42÷99.46% extraction into the MgO solution . Therefore, the optimal parameters for the process of nitric acid decomposition of dolomite are: nitric acid concentration - 40%, temperature 30÷40 ° C, time - 30 minutes. [1].

The role of microelements in plant nutrition is multifaceted. Microelements increase the activity of many enzymes and enzyme systems in the plant body and improve the use of macrofertilizers and other nutrients from the soil by plants [2].

Therefore, this article is devoted to scientific research on the production of liquid fertilizers containing, in addition to N , Ca , Mg , K_2O , also physiologically active substances and microelements.

Previously, we identified the optimal conditions for obtaining liquid fertilizer by nitric acid decomposition of dolomite to obtain, after separation of the insoluble residue, a solution of calcium and magnesium nitrates, followed by enrichment of the latter with ammonium and potassium nitrate [3].

To obtain a liquid fertilizer containing a physiologically active substance, monoethanolammonium nitrate , the dependence of changes in the physicochemical properties of solutions on the composition of the components in the system {68.0[41.53% $\sum Ca(NO_3)_2 + Mg(NO_3)_2$ + 58.47% H_2O]+ 20% NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ }- $HNO_3 \cdot NH_2C_2H_4OH$ by measuring the crystallization temperature, density, viscosity and pH of the medium [4,5,6]. Based on

British Journal of Global Ecology and Sustainable Development
Volume-28, May - 2024
ISSN (E): 2754-9291

the data obtained, a "composition-properties" diagram of the system was constructed (Fig. 1).

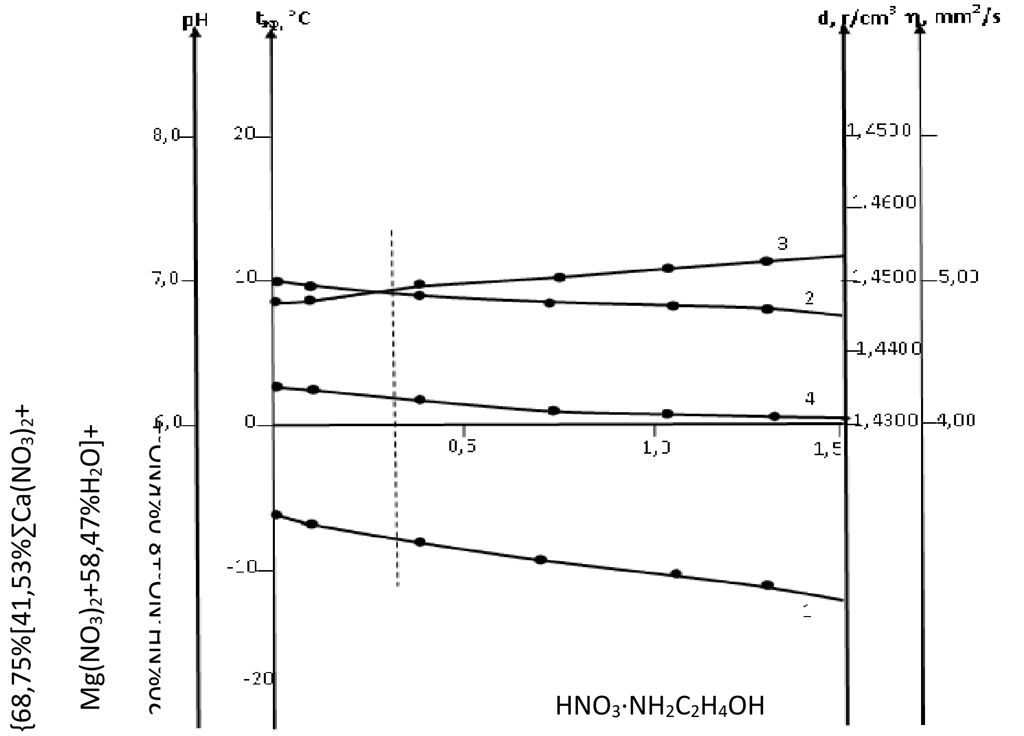


Fig.1. Dependence of changes in crystallization temperature (1), pH (2), density (3) and viscosity (4) of solutions on the composition in the system

{ 68.75[41.53 % $\sum Ca(NO_3)_2$ +$Mg(NO_3)_2$ +58.47 % H_2O]+ 20% NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ } - $HNO_3 \cdot NH_2C_2H_4OH$

From the literature it is known that the optimal dose of monoethanolammonium nitrate, which helps accelerate the growth and development of plants and accelerates the ripening process of agricultural crops, is 0.25÷0.3% [7].

Based on the results obtained, shown in Figure 1, it follows that when 0.25÷0.3% monoethanolammonium nitrate is dissolved in a solution of composition {68.75[41.53 % $\sum Ca(NO_3)_2$ + $Mg(NO_3)_2$ +58.47 % H_2O] + 20% NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ } a solution of liquid fertilizer is formed with a crystallization temperature of -7.0÷- 8.0°C, density 1.4479÷1.4490 g/cm ^{3}, viscosity 4.18÷4.24 mm ^{2} /s and pH 6.94÷6.98.

In order to introduce microelements such as Cu , Co and Ni into the resulting liquid fertilizer, the dependence of changes in the crystallization temperature, density, viscosity and pH of the solution environment on the composition of the components in the systems was studied :

I. {68.45%[41.53 % $\sum Ca(NO_3)_2$ +$Mg(NO_3)_2$ + 58.47 % H_2O]+ 20%NH_4NO_3 + 8.0% KNO_3 +3.25% $NH_2C_2H_4OH$ + 0.3% $HNO_3 \cdot NH_2C_2H_4OH$}-$Cu(NO_3)_2 \cdot 3H_2O$;

II. {68.45%[41.53% $\sum Ca(NO_3)_2$ +$Mg(NO_3)_2$ +58.47% H_2O]+ 20%NH_4NO_3 + 8.0% KNO_3 +3.25% $NH_2C_2H_4OH$ + 0.3% HNO_3•MEA}-$Co(NO_3)_2 \cdot 6H_2O$;

III. {68.45%[41.53% ∑$Ca(NO_3)_2$ +$Mg(NO_3)_2$ +58.47% H_2O]+ 20%NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ +0.3% HNO_3 • MEA }- $Ni(NO_3)_2$ •$6H_2O$ and their "composition-property" diagrams (Fig.2,3,4).

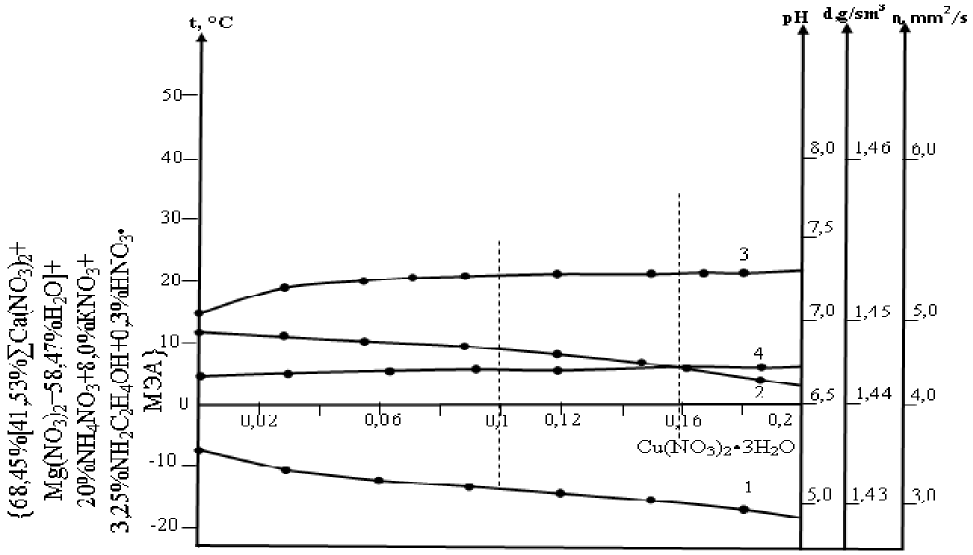


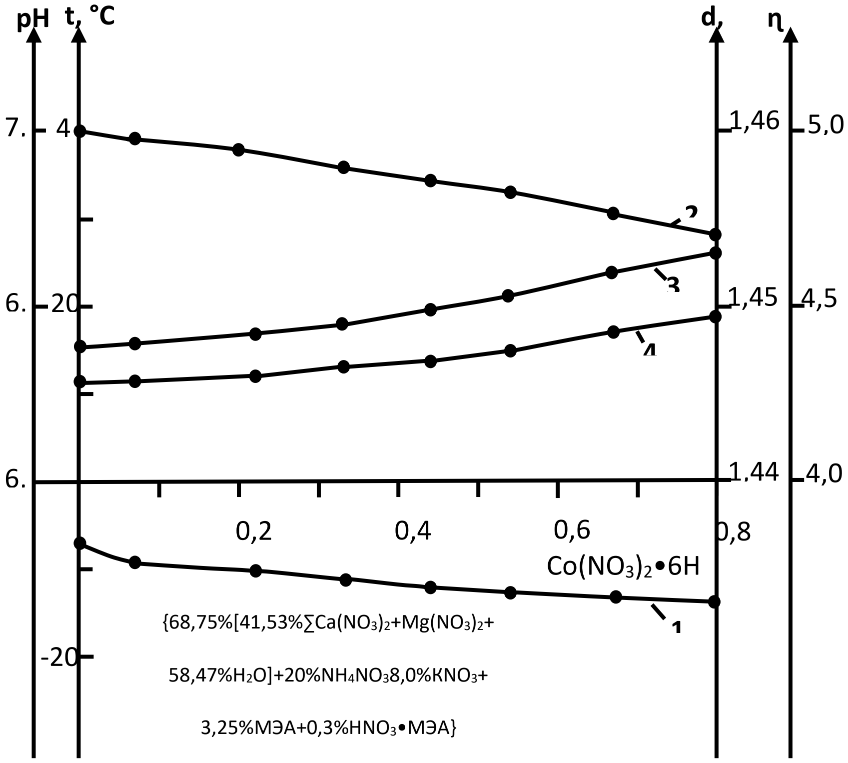
Fig.2. Dependence of changes in crystallization temperature (1), pH (2), density (3) and viscosity (4) of solutions on the composition in the system {68.45%[41.53 % ∑ $Ca(NO_3)_2$ + $Mg(NO_3)_2$ +58.47 % H_2O] +20% NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ +0.3% HNO_3 • MEA }- $Cu(NO_3)_2$ •$3H_2O$

Analysis of the "composition-crystallization temperature" and "composition-pH" diagrams (Fig. 2, curves 1, 2) shows that as copper nitrate is added to the liquid fertilizer solution, the values of the crystallization temperature and pH of the newly formed solutions gradually decrease t_{cr} from -7.9°C to -18.0°C and pH from 6.94 to 6.68, respectively. The values of density and viscosity of newly formed solutions gradually increase as copper nitrate is added (Fig. 2, curves 3,4) d from 1.4484 to 1.4522 g/cm ^{3} and η 4.20 to 4.30 mm ^{2} /s accordingly.

No kinks are observed in these curves of the diagram (Fig. 2), i.e. within the studied concentration limits of this system, there is no change in the crystallizing solid phases and the components of the system retain their individuality, and therefore physiological activity.

Analysis of the "composition-properties" diagram of system II (Fig. 3, curves 1-4) also shows that as cobalt nitrate is added to the liquid fertilizer solution, the values of the crystallization temperature and pH of the newly formed solutions gradually decrease tcr from -7.0 °C to -14.0°C and pH from 7.0 to 6.7, respectively. And the values of density and viscosity of newly formed solutions gradually increase with increasing concentration of cobalt nitrate.

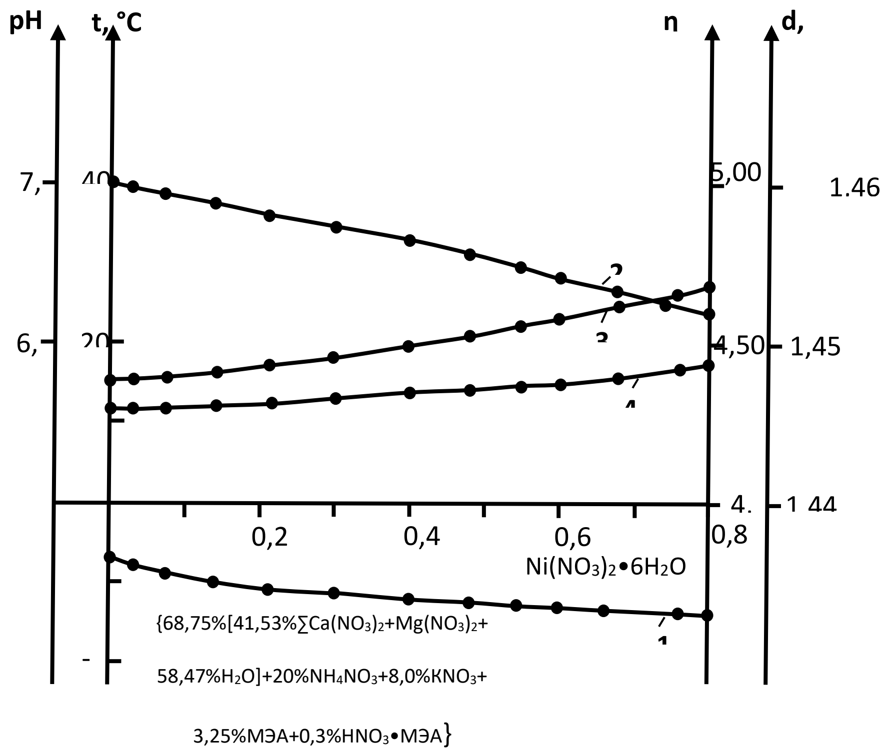
Journal Zone Publishing, Ilford, United Kingdom



Rice. 3. Dependence of changes in crystallization temperature (1), pH (2), density (3) and viscosity (4) of solutions on the composition in the system {68.45%[41.53% ∑ $Ca(NO_3)_2$ + $Mg(NO_3)_2$ +58.47% H_2O]+ 20% NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ +0.3% HNO_3 • MEA }- $Co(NO_3)_2$•6H_2O

There are also no kinks observed in the curves of the diagram of this system, i.e. within the studied concentration limits of this system, there is no change in the crystallizing solid phases and the components of the system retain their individuality, and therefore physiological activity.

Analysis of the “composition-properties” diagram of system III (Fig. 4, curves 1-4) also shows that as nickel nitrate is added to the liquid fertilizer solution, the same pattern is observed as in previous systems I , II . That is, the values of the crystallization temperature and pH of the newly formed solutions gradually decrease, and the values of the density and viscosity of the newly formed solutions gradually increase with increasing concentration of nickel nitrate.



Rice. Fig . 4. Dependence of changes in crystallization temperature (1), pH (2), density (3) and viscosity (4) of solutions on the composition in the system {68.45%[41.53% ∑ $Ca(NO_3)_2$ + $Mg(NO_3)_2$ +58.47% H_2O]+ 20% NH_4NO_3 + 8.0 % KNO_3 +3.25% $NH_2C_2H_4OH$ +0.3% HNO_3 • MEA }-$Ni(NO_3)_2$ •6 H_2O

in the curves of the diagram of this system III , i.e. within the studied concentration limits of this system, there is no change in the crystallizing solid phases and the components of the system retain their individuality, and therefore physiological activity. Based on the results of studying the "composition-properties" of the above systems and preliminary agrochemical tests of various compositions, it follows that in order to obtain a complex liquid fertilizer containing the microelement Cu (or Co), (or Ni), it is necessary to dissolve copper nitrate (or nitrate) in the initial solution cobalt), (or nickel nitrate) at a mass ratio of 1.0:0.001÷0.002. The resulting fertilizer solutions have the following physical and chemical properties:

1) Blue solution, crystallization temperature -14.0÷-18.0° C, density 1.4516÷1.4522 g/cm ^{3}, viscosity 4.25÷4.30 mm ^{2}/s, pH=6, 82÷6.62 and contains: wt. % Ntot = 13.4 ; MgO =3.38; CaO =5.7; K_2O -3.6; FAV-0.25÷0.3; Cu -0.0 2-0.026 .

2) Reddish solution, crystallization temperature -9.0÷-10.0°C, density 1.4480÷1.4484 g/cm ^{3}, viscosity 4.29 ÷ 4.30 mm ^{2}/s, pH=6, 97 ÷6.9 5 and contains: wt. % Ntot = 13.4 ; MgO =3.38; CaO =5.7; K_2O -3.6; FAV-0.25÷0.3; C o-0.01÷0.02.

3) Green solution , crystallization temperature -10.0÷-11.0°C, density 1.4486÷1.4491 g/cm ^{3}, viscosity 4.33÷4.34 mm ^{2}/s, pH=6, 80÷6.72 and contains: wt. % Ntot = 13.4 ; MgO =3.38; CaO =5.7; K_2O -3.6; FAV-0.25÷0.3; Ni -0.01÷0.02.

These solutions can be recommended as complex liquid fertilizers containing simultaneously such nutrients as N , Ca , Mg , K_2O, PAS and Cu (or Co), (or Ni) .

Conclusions

Thus, by studying the dependence of changes in the physicochemical properties of solutions on the content of components in the above systems, optimal technological parameters for obtaining liquids have been established fertilizers of complex action, containing at the same time such nutritional elements as N , Ca , Mg , K_2O, PAS and Cu, (or Co) , (or Ni) .

Preliminary agrochemical tests of the resulting fertilizers showed their positive effect on the growth, development and acceleration of the ripening process of agricultural crops.

References

1.Saydullayeva GA, Askarova MK, Eshpulatova MB Study of the process of decomposition kinetics dolomite mestobrith “' Shorsu ”
A Conference for The Educators International Conference On Developments In Education.Bursa,Turkey - 2022.p.15-17

2. Bulygin S.Yu., Demishev L.F., Doronin V.A., Zarishnyak A.S., Pashchenko Y.V., Turovsky Yu.E., Fateev A.I., Yakovenko M.M., Cordin A.I. Microelements in agriculture. Dnepropetrovsk, 2007. –P.100.

3. Askarova M.K., Isabaev Z., Eshpulatova M.B., Makhamatova G.B.,
Ergashev D.A., Isabaev D.Z. Research of systems that justify the process of obtaining liquid fertilizer of complex action // International scientific research journal “Eurasian Union of Scientists”. No. 5(62), 2019. -P.25-30.

4. Zdanovsky A.B. Gallurgy.- L.: Chemistry. 1972. -572 s.

5. Frolov Yu.G. Course of colloidal chemistry //Surface phenomena and disperse systems.- M.: 1982.-P.117-124.

6 . Gorbochev S.V. Workshop on physical chemistry. - M.: Higher School. 1974.-310p.

7. Togasharov A.S. Polytherm of solubility of the system magnesium chlorate - monoethanolammonium nitrate - water // Uzbek Chemical Journal. -Tashkent, 2010.- No. 3.-P.40-43.

Journal Zone Publishing, Ilford, United Kingdom