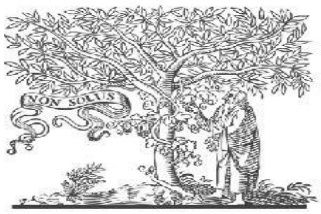
International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

COPY RIGHT



ELSEVIER
SSRN

IJIEMR Transactions, online available on 28th March 2021. Link
https://ijiemr.org/downloads/Volume-10/ISSUE-3

DOI: 10.48047/IJIEMR/V10/I03/106

Title: **OBTAINING CALCIUM NITRATE FROM LIMESTONE AND NITRIC ACID RESEARCH OF ACIDITY IN THE SYSTEM $Ca(NO_3)_2 – HNO_3 – H_2O$**

Volume 10, Issue 03, Pages: 491-493.

Paper Authors
Z.T.Ruzieva[1], A.Ruziev[2],

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

OBTAINING CALCIUM NITRATE FROM LIMESTONE AND NITRIC ACID RESEARCH OF ACIDITY IN THE SYSTEM $Ca(NO_3)_2 – HNO_3 – H_2O$

Z.T.Ruzieva, Associate Professor;

A.Ruziev, Assistant

Karshi Engineering-Economics Institute

Abstract: The use of calcium nitrite as one of the components of dry mixes in construction is also im portant. Modern dry mixes used in construction are multicomponent specialized systems, which, in ad dition to the mineral binder and filler, contain a complex of chemical additives (in particular, sodium or calcium nitrite

Keywords: decomposition, calculated, analysis, the literatur

Introduction

The use of calcium nitrite as one of the components of dry mixes in construction is also important. Modern dry mixes used in construction are multicomponent specialized systems, which, in addition to the mineral binder and filler, contain a complex of chemical additives (in particular, sodium or calcium nitrite from 4 to 10% by weight of the dry mix), providing the necessary rheological properties of the mix, regulating the speed of setting and hardening of the binder and giving the necessary physical and mechanical properties to the solution after hardening [1].

In Western Europe, the production and use of dry mixes in construction is massive. Per capita production of dry mixes is about 30 kg per year in Germany, and about 20 kg in Finland and Sweden; in Poland, where licensed production of dry mixes has developed, this figure is about 23 kg [2].

When limestone is treated with 58-65% nitric acid, a nitric acid extract is obtained, which is a complicated complex with many dissolved components. It can be assumed that the density and viscosity of liquids play an important role [3].

The required amount of nitric acid for decomposition was calculated using the reaction equation:

$$CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + CO_2 + H_2O$$

Analysis of the data shows that with an increase in the concentration of HNO_3 from 15 to 45%, the degree of decomposition of limestone in 40 minutes increases by 1.15 times, and with a further increase - by 1.12 times.

The viscosity and density of nitric acid extracts obtained by treating limestone with nitric acid have not been studied and there are no corresponding data in the literature. The study of the viscosity and density of extracts is caused not only by the above considerations, but also by the fact that in the design of some production apparatuses and installations, there is often a need to know the viscosity and density of liquid flows.

For solutions, the dependence of density and viscosity on the amount of moisture was determined at temperatures of 20, 40 and 60°C.

With an increase in the temperature and the amount of water in the solution, the viscosity and density decrease, which is consistent with the existing situation.

A change in the percentage of nitric acid in a solution does not change the dependence of viscosity on temperature.

Graphical analysis of the data showed that the viscosity of a solution of nitrate with a content of 10-20% free nitric acid and 58% nitric acid are on one straight line. Consequently, it could be assumed that by increasing the content of free HNO_3 in the solution, it is possible to obtain a mixture with a given amount of moisture, free nitric acid with the required viscosity and density [4,5].

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Based on the work performed, it can be concluded that in all the solutions we have taken, an increase in the water content and an increase in temperature lead to a decrease in the values of viscosity and density.

These observations are in good agreement with the general position for most liquids.

An increase in free nitric acid leads to a decrease in viscosity and a very slight increase in density.

A high value of viscosity is observed in solutions with a high content of calcium nitrate [6].

One of the main indicators for controlling the process of decomposition of limestone with nitric acid is the acidity of the reaction pulp.

However, as shown in the previous section of this work, the acidity of calcium nitrate solutions is interrelated with the content of calcium nitrate and free nitric acid.

Therefore, not knowing the functional dependence of the acidity of the system $Ca(NO_3)_2$ –HNO_3-H_2O; f(C_{HNO_3}, $C_{Ca(NO_3)_2}$)=pH from content $Ca(NO_3)_2$ and HNO_3, it is difficult to judge the properties of the reaction mass.

To obtain such a dependence, solutions of calcium nitrates of various concentrations were prepared. Concentrated nitric acid (52.5%) was gradually added to these solutions in portions. After each portion of nitric acid, the mixture was stirred using a magnetic stirrer for 3-5 minutes, the pH of the solutions was measured using the I-130 monomer. The experimental results are shown in Figures 1 and 2.

Figure 1 shows that changes in pH in the system $Ca(NO_3)_2$-HNO_3 - H_2O is complicated, therefore, the functional dependence of pH on the concentration of HNO_3 was obtained by interpolating the experimental data. The results of the experiments, in order to clearly show the change in the dependence pH=f ($C_{Ca(NO_2)_2}$, C_{HNO_3}), are shown in volumetric form (Fig-2). Greatest effect on system acidity $Ca(NO_3)_2$-HNO_3-H_2O has a concentration of HNO_3 in the range of 0-0.025 mol%. In these intervals, the concentration of HNO_3, ΔpH, depending on the content of $Ca(NO_3)_2$ in the solution, ranges from 2 to 5.

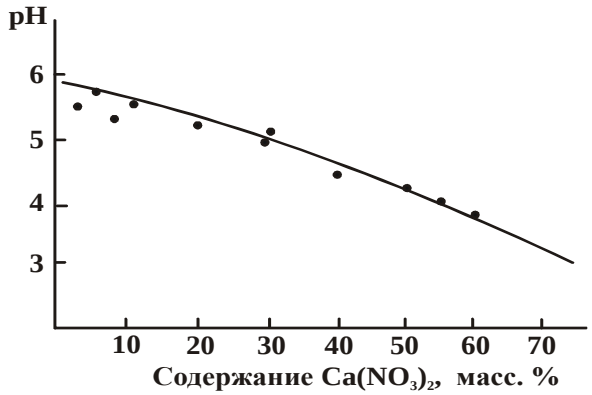


Figure 1. Change in the acidity of the solution (pH) depending on the concentration of calcium nitrate.

For instance, $C_{Ca(NO_3)_2}$ at –0 and 70 wt%, ΔpH is equal to 1.5 and 4.5, respectively. This nomogram allows you to accurately and quickly determine one of the three unknown parameters (pH, C_{HNO_3}, $C_{Ca(NO_3)_2}$).

If the content of $Ca(NO_3)_2$ in the solution is known, then after measuring its pH using Figure 2, the content of HNO_3 is determined.

For example, to determine the HNO_3 content using Fig.-2 from a solution with pH-1.08 containing 35% $Ca(NO_3)_2$, a straight line CC_3 is drawn from point "C" parallel to line AB. From the formed points C and C_3, draw a perpendicular to the lines BD and AC to the intersection (curves B′D′ and A′C′).

From points C′ and C_3′ a curved line is drawn C′, C_1′, C_2′, C_3′ symbatically to the curve a′, a_1′, a_2′, a_3′. To determine the desired point on the ABDS plane, which shows the concentration $C_{Ca(NO3_3)_2}$ and C_{HNO_3}, find height C_x C_x′.

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

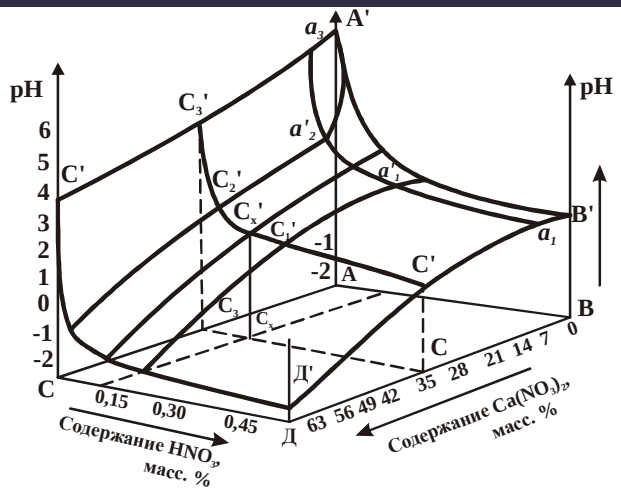


Figure 2. Dependence of the pH of solutions in the system $Ca(NO_3)_2$-HNO_3-H_2O from content HNO_3 и $Ca(NO_3)_2$.

This segment is equal to the pH value and is located between lines CC_3 and $C'C_3'$. In our example, pH(C_x C_x')=1,08. Along the found point C_x on the ABDS plane, a parallel is drawn to the $Ca(NO_3)_2$ concentration axis until it intersects with the nitric acid concentration axis. The resulting point, equal to 0.112%, is the desired content in the solution.

Thus, with the help of this nomogram, it is possible to determine the necessary technological parameters for the nitric acid decomposition of limestones.

Literature

1. Popov K.N., Kaddo M.B., Pulyaev S.M., Dry mixtures // Stroy pofil.-2001. -№4.-70-80 p.
2. Azimov R.A. The physiological role of calcium in the salt tolerance of cotton – Toshkent: Science, - 1973-184p.
3. Atroshenko V.I. and others. Technology of bound nitrogen. Kiev. "Higher school". - 1985.-327 p.
4. Atroshchenko V.I., Kargin S.I. Nitric acid technology. M.: Chemistry, -1970.-494 p.
5. Beglov B.M., Namazov Sh.S., Dadahodzhaev A.T. and others. Calcium nitrate. Its properties, receipt and application in agriculture. Tashkent - "Mekhnat", - 2001. - 280 p.
6. Pozin M.E. Mineral salt technology. Goskhimizdat., L.Chemistry, 808 p.