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INVESTIGATION OF THERMAL STABILITY, MODIFICATION OF THE TRANSITION, AND SPLITTING OF AMMONIUM NITRATE WITH DOLOMITE ADDITIVES

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ANNOTATION

Thermal analysis, deformation modification of thermal cooling, thermal analysis of limestone-ammonium nitrate samples obtained after adding dolomite flour at the Shursu, Dekhkanabad, Navbakhor, Karnob and Ketmonchi deposits with a temperature of 175 ° C and 100 wt. and the results of determining the strength of grains, grain stability. The initial decomposition temperature and the activation energy of the obtained samples were studied in the range from 25 to 300 ° C, and the production of grain grains was carried out in accordance with the grinding process in columns. The thermal stability of magnesium limestone-ammonium nitrate grain was studied during heating and cooling cycles of 20-60 °C.

KEYWORDS: ***Polymorphic changes, dolomite flour (DF), ammonium nitrate (AN), viscosity, hardness, modification change, thermocycles, properties, detonation ability, viscosity, buffer effect, pH (hydrogen indicator), lime nitrate (LN).***

INTRODUCTION

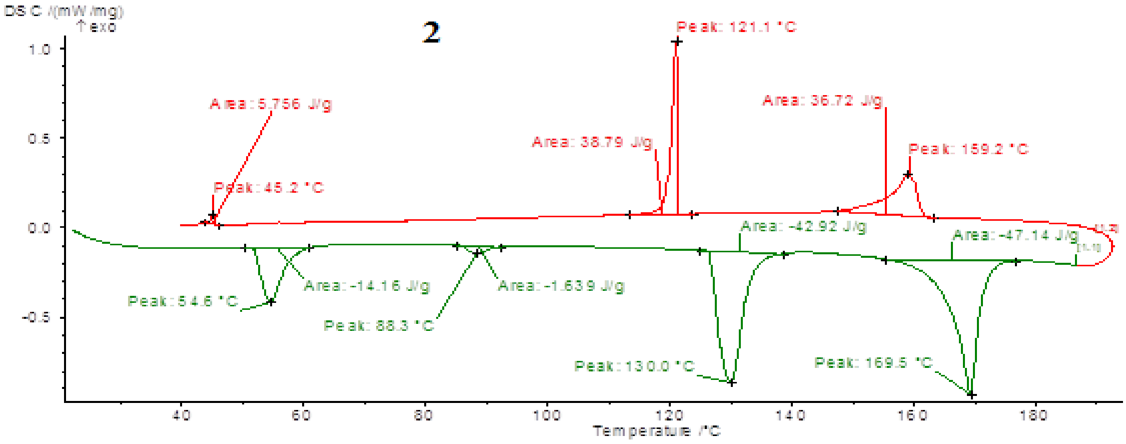
The influence of lime nitrate (LN) on the heat treatment of polymorphic changes in lime nitrate is studied. Thermal analysis of the samples was carried out on NETSCH STA 409 PC / PG equipment (manufactured in Germany) by heating and cooling at a temperature from 25 to 175 °C - from 175 to 25 °C. It was shown that pure NH_4NO_3 liquid is usually IV → III; III → II; II → I and I → passes fluid changes. At the same time, the polymorphic transitions IV → III are 46 °C, III → II - 85 °C, II → I – 126 °C and I → 169 °C. For samples of magnesium, lime, and ammonium nitrate, there were also 4 modifications in the sequence that were specific for NH_4NO_3 but differed in the transition temperature. Liquid cooling of NH_4NO_3; I → II; II → III and III → IV changes 169; 125; Goes between 48 and 30 °C. Modifying changes in the cooling of magnesium, lime, ammonium nitrate; I → II; Passes through II → IV. In this case, phase III does not occur; transition II-IV avoids phase III, which allows the crystal lattice to be deformed and their grain stability (Table 1).

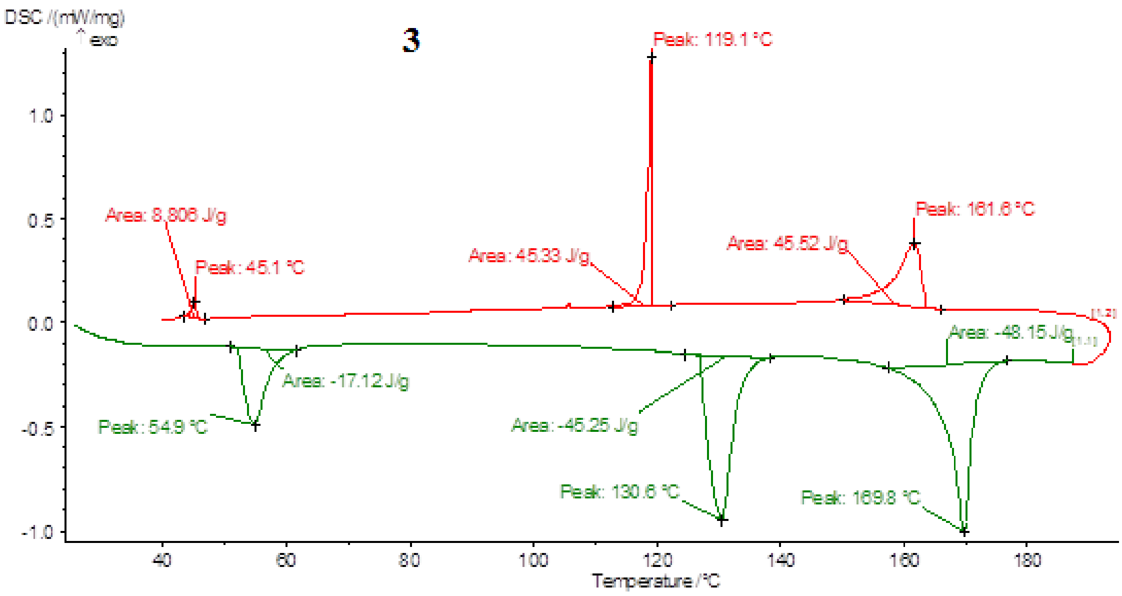
THE MAIN RESULTS AND FINDINGS

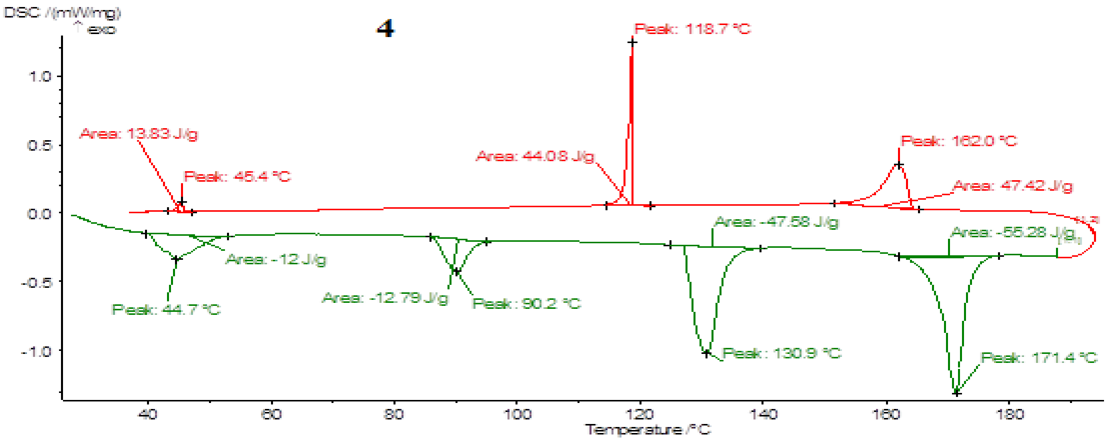
Table 1
Modified transition temperatures of magnesium of lime-ammonium nitrate

AN : DF Absolute mass	Curve Line Height								
	IV→III	III→II	II→I	I→ fluid	fluid	I→II	II→III	III→IV	II→IV
	from 25 to 175 °C heating				from 175 to 25 °C cooling				
NH_4NO_3	46	85	126	169	169	125	48	30	-
100 : 5	54,6	88,3	130,0	169,5	159,2	121,1	-	-	45,2
100 : 15	54,9	89,2	130,6	169,8	161,6	119,1	-	-	45,1
100 : 25	44,7	90,2	130,9	171,4	162,0	118,7	-	-	45,4
100 : 45	54,0	89,9	130,9	171,8	162,6	118,2	-	-	45,3

In NETSCH STA 409 PC / PG, the initial decomposition temperature and the activation energy of magnesium, lime and ammonium nitrate samples were determined at a temperature from 25 to 300 ° C.







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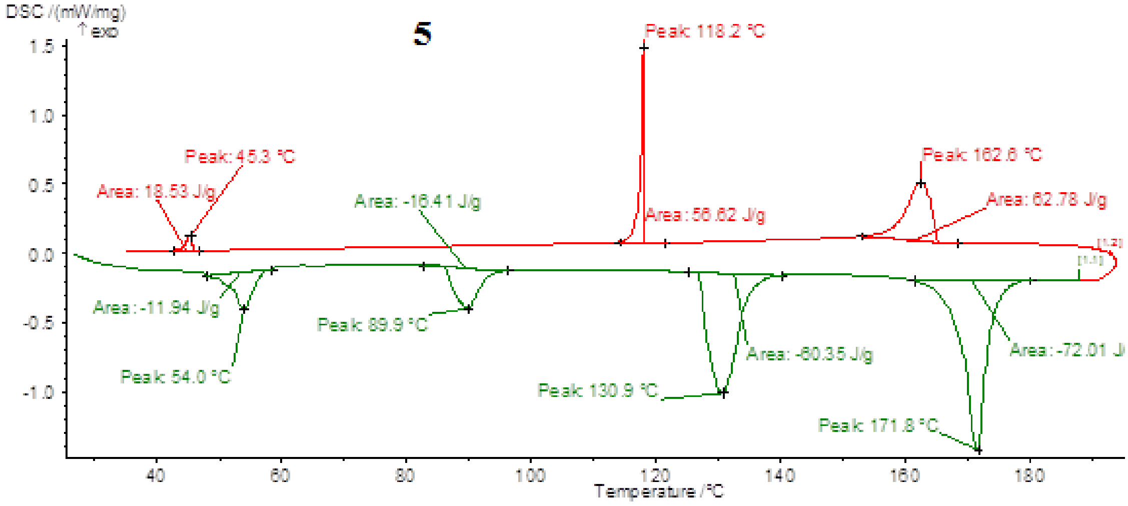
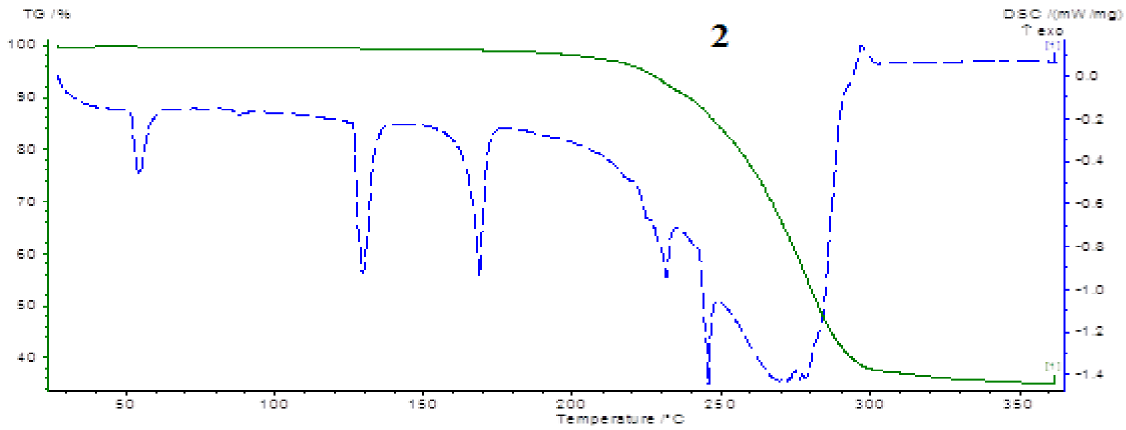


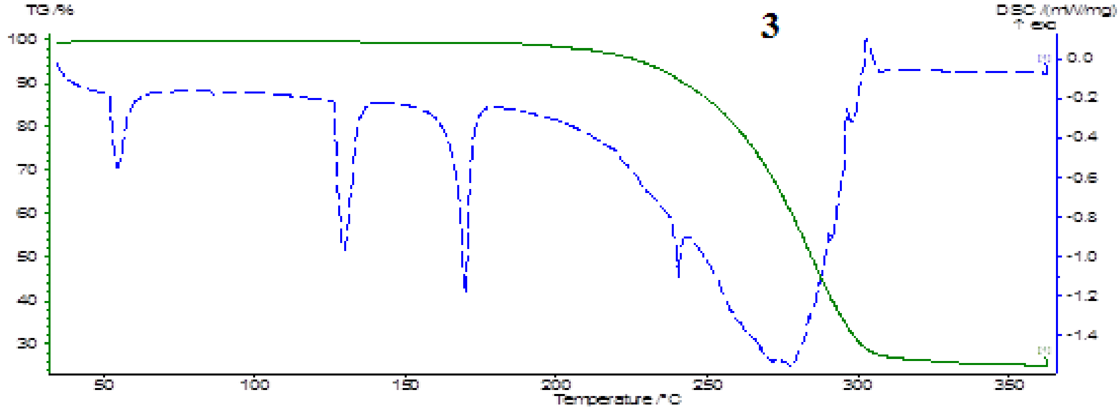
Modified transition temperatures of thermostable ammonium nitrate with dolomite additives (Photo 1)

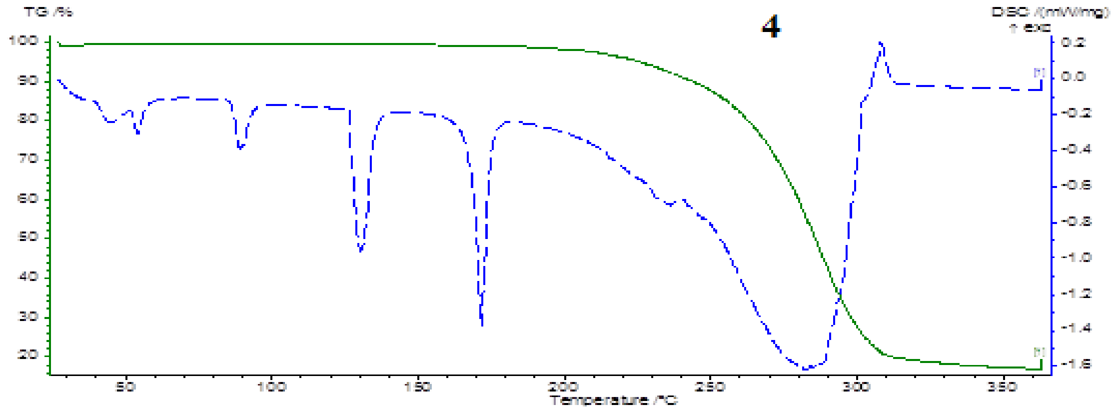
As shown in Table 2 and Figure 2, the initial decomposition temperature and activation energy of pure NH_4NO_3 are 211.30 °C and 9915 J / g, whereas in magnesium and lime-ammonium nitrate samples these values are 247.3-2590 °C and -840 between -906.6 J / g. It can be seen that the thermal decomposition of magnesium, lime and ammonium nitrate requires higher temperatures and more energy than pure NH_4NO_3. All this suggests that dolomite flour (DF) reduces the detonation ability of AN.

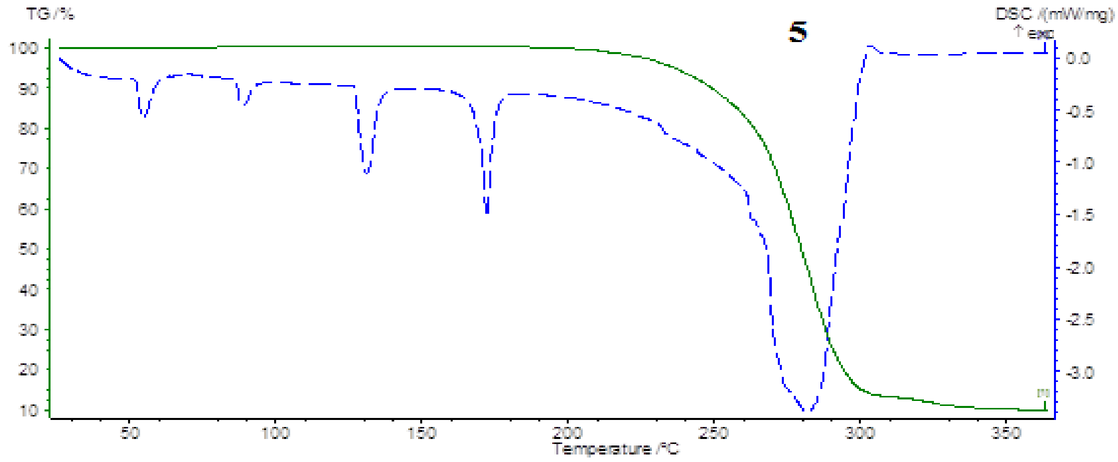
Initial temperature and thermal decomposition value of heat-resistant ammonium nitrate with dolomite additive

AN : DF weight ratio	Temperature ranges studied	Initial decomposition temperature, ⁰C	Activation energy, w / g.
pure NH_4NO_3		211,0	-915,1
100 : 5		247,3	-840,6
100 : 15	200–300	251,9	-856,4
100 : 25		258,6	-889,5
100 : 45		259,0	-906,6









Thermogram of heat-resistant ammonium nitrate with dolomite additives (Figure 2)

Pure NH_4NO_3 grains decompose by 5% after 10 thermal cycles and completely decompose after 80 thermal cycles. Heat-resistant ammonium nitrate with dolomite additives, containing 5% OU, is destroyed by 5% after 30 thermal cycles. AN : DF = 100: 25 magnesium lime-ammonium nitrate with an optimal ratio maintains grain integrity up to 25 thermal cycles, and after 100 thermal cycles - up to 71% integrity. The higher the DF in the NH_4NO_3 liquid, the higher the thermal resistance of the grains (Table 3).

Heat resistance of heat-resistant grain of ammonium nitrate with dolomite additives to heating and cooling cycles of 20-60 ° C. Table 3

AN : DF weight ratio	The degree of destruction of thermostabilized AN grains upon transition to form IV → III,%				
	10 cycle	25 cycle	50 cycle	90 cycle	100 cycle
pure NH_4NO_3	5	21	36	100	–
0,28% MgO added AN	–	13	27	82	100
100 : 3,0	-	9	21	59	72
100 : 5,0	-	7	18	47	65
100 : 10	-	-	12	30	44
100 : 15	-	-	10	25	38
100 : 20	-	-	9	23	35
100 : 25	-	-	7	20	29
100 : 30	-	-	-	13	25
100 : 35	-	-	-	9	21

Table 4 presents the results of the buffer effect of DF on the pH of the NH_4NO_3 medium at a temperature of 180 °C. Thermal decomposition takes into account the following evidence that one of the reasons for the decomposition of NH_4NO_3 is its increased acidity. DF has a buffering effect on the acidity of NH_4NO_3. For example, the pH of dilution of NH_4NO_3 at 180 °C and 120 minutes with an initial decrease from 5.17 to 2.12. At this time, it was found that AN : DF = 100 : 25 decreases from 7.21 to 6.03. That is, an intensive souring process does not occur, because liquid-free HNO_3 is neutralized by the CaMg $(CO_3)_2$ mineral from dolomite.

Buffer effect of dolomite flour NH_4NO_3 on the pH of the medium. Table 4

AN : DF weight ratio	The effect of 10% fertilizer solutions on the pH time, min.								
	0	5	10	20	40	60	80	100	120
pure NH_4NO_3	5,17	2,70	2,61	2,54	2,43	2,34	2,25	2,19	2,12
100 : 3	6,83	6,36	5,92	5,60	5,41	5,30	5,24	5,18	5,07
100: 5	6,86	6,61	6,43	6,27	6,15	6,0	5,89	5,72	5,56
100: 15	7,05	6,87	6,72	6,58	6,40	6,28	6,16	6,07	5,90
100: 25	7,21	7,12	7,01	6,87	6,69	6,45	6,31	6,19	6,03
100 : 35	7,34	7,20	7,11	7,0	6,88	6,72	6,54	6,36	6,12
100 : 45	7,42	7,28	7,17	7,06	6,90	6,83	6,67	6,48	6,31

CONCLUSION

Regardless of the op-amp, an increase in temperature decreases the AC intensity and viscosity. The density and viscosity of dolomite-nitrate dilution at AN : DF = 100: (0.5-35) and temperature (165-180 °C) are 1.591-1.768 kg / cm³ and 6.12-10.43 s Pz, respectively, suitable for grinding. Based on the results, it can be concluded that DF is a good modifier to improve the physicochemical and consumer properties of AN, such as brucite, magnesite, ammonium sulfate, lime, chalk, phosphorite flour, bentonite and other inorganic additives. DF is a cheap and convenient raw material that determines its economic feasibility in the production of nuclear power plants.

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