

imum temperature for 3 hours. At the output of the first stage there was turned opaque, but tablets were enough strong.

During the firing process occurs baking samples, accompanied by a change, specifically the size reduction of the samples. It was found that a composition 1 was sintered more rapidly than the composition 2. In this case, at all temperatures firing linear shrinkage of composition 1 in 3 times is more than shrinkage of composition 2. Using the nanopowder in the composition 1 resulted more dense samples.

XRD analysis of the test samples showed that, at any temperature of firing there are peaks of the synthesized aluminum oxynitride and aluminum nitride in samples of various compositions.

And with increasing firing temperature inten-

sity of the peaks of aluminum oxynitride $Al_{23}O_{27}N_5$ increases, which indicates an increase in the number of its synthesized blends. It was found that the use of aluminum nitride nanopowder promoted the formation $Al_{23}O_{27}N_5$ at lower temperatures, as at 1750 °C aluminum oxynitride was the main phase of the X-ray. In the case of mixture 2 (micron powders of aluminum oxide and nitride) were used at a temperature of 1750 °C firing on radiographs AlN. is the main phase.

The increasing of the synthesis temperature to 1850 °C causes an intensification of the synthesis of oxynitride for the composition 1 and 2. Therefore, the research showed the efficiency of the use of powders with different particle sizes in the process of synthesis of aluminum oxynitride.

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OPTIMIZATION OF SYNTHESIS PROCESS OF N-CARBOXYMETHYL MALEAMIC ACIDS

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The entire modern development of humanity is inextricably connected with the development of polymer industry – the creation of new and development of existing polymers, creation of products with new properties. An urgent problem is production of maleamic acid, since these substances are necessary for the development of new polymeric materials as intermediate products. Derivatives of dicyclopentadiene is one of the popular types of monomers to

produce new structural materials. Since Dicyclopentadiene is of high reactivity, it is used to produce a wide range of synthetic products. N-substituted maleimides are of the greatest interest as they contain different functional groups in their structure.

The raw material for norbornene-dicarboximide are dicyclopentadiene and N-carboxymethyl maleamic acid.

The scheme of this process is shown in the first

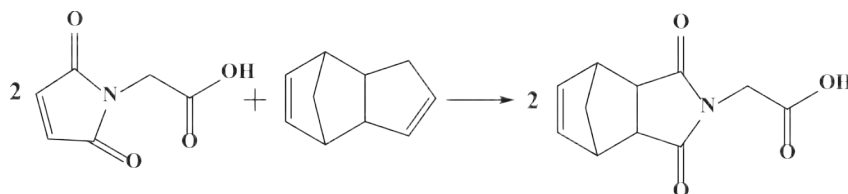


Fig. 1. Reaction scheme preparation of 5-norbornene-2,3-dihydroxy glycine

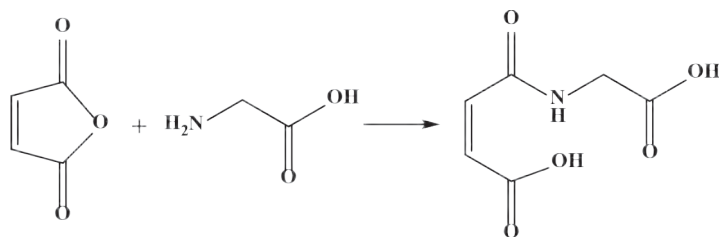


Fig. 2. Scheme of reaction to produce N-carboxymethyl maleamic acid

Table 1. Conditions of the syntheses

Number of synthesis	1	2	3	4	5
Time, min.	60	120	180	120	120
Temperature, °C	25	25	25	50	80

Table 2. Result of the syntheses

Number of synthesis	1	2	3	4	5
Mass, g	5.4	6.5	5.9	6.5	5.8
Yield, %	61.4	73.6	67.38	73.7	65.8

figure.

Dicyclopentadiene is a by-product of ethylene and propylene production made at high temperature pyrolysis of petroleum fractions. 2-maleimide acetic acid is prepared from N-carboxymethyl maleamic acid.

We have investigated the reaction producing N-carboxymethyl maleamic acid (figure 2).

There are several methods for producing N-carboxymethyl maleamic acid. According to one of the existing methods, this substance is prepared during three hours at room temperature in acetic acid [1]. Due to this method the substance yield is 95%. Another method of synthesis of N-carboxymethyl maleamic acid consists in heating substance during 10 minutes with the yield of 98% [2]. Also, there are several ways of obtaining the desired product in acetic acid during 12 hours and 16 [3, 4]. So, there is a need for effective methods of synthesis of N-carboxymethyl maleamic acid.

Objective: to optimize synthesis process of

N-carboxymethyl maleamic acids. This method should be of high yield, less energy consumption, product purity.

To achieve this goal the following parameters were measured: the synthesis time and the reaction mass temperature. The optimal conditions were selected depending on yield.

Conditions of the syntheses are given in Table 1.

Identification of N-carboxymethyl maleamic acid was carried out by IR spectroscopy and elemental analysis.

Results of the syntheses are given in Table 2.

Based on the table above, the highest yield of the main product in the reaction is achieved in two hours at room temperature. Increasing the reaction time to 3 hours does not lead to higher yields.

Probably, the reduction in the yield by increasing the temperature of the reaction mass is related to dissolving the reaction product in the solvent.

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