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THE INFLUENCE OF THE PRESSURE OF GASEOUS REACTION PRODUCTS ON THE RATE OF DISSOCIATION OF BASIC ALUMINIUM AMMONIUM SULFATE AND GENERAL REGULARITIES OF THE PROCESS

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ABSTRACT

The kinetics of the isolated stages of thermal decomposition of basic salt in the atmosphere some gaseous dissociation products have been examined. The identification of kinetic parameters of the providing processes in isothermal -isobaric conditions have been done. The possibility of the expantion of general regularities of thermal dissociation of solid substances in complicated system have been attested, comparing with systems which were studied up to now-process of thermal decomposition of basic aluminium ammonium sulfate have been conformied.

RESULTS AND DISCUSSION

The kinetic studies for erlier isolated stages of decomposed compound 1/ in isothermal-isobaric conditions have been provided. In the first stage /I/of the dissociation of basic salt /e.g. during preliminary dehydratation of compound/ an influence of the pressure of water vapour on the carried process. The kinetic measurements in the water vapour atmosphere in the region pressure from 9.8 to 18.5 hPa have been carried out. In the second stage /II/ /e.g. during farther dehydratation and displacing ammonium/ the measurements in the atmosphere of water vapour in the region pressure from 3.4 to 10.5 hPa and in the atmosphere of gaseous ammonium in the region pressure from 6.7 to 20 hPa have been done. On the Fig. 1 the example of kinetic curves obtained in these conditions have been presented. On the base of data obtained from Jander and Ginstling-Bronstein's the kinetic parameters /values of the Arrhenius activation energy E and pre-exponential coefficient A/ have been identifated.

The kinetic parameters founded in isobaric conditions have been utilized to the verification of general regularities of kinetic of the thermal decomposition of solid substances in the

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investigated process.

In the first stage /I/of the thermal dissociation of basic salt in the atmosphere of water vapour the Zawadzki-Bretsznajder regularity have been observed, the existance of isokinetic temperature, the apperance of the compensation efect, also an existance of the specific correlation between activation energy and supersaturation according to which the value of the calculated activation energy of the process on the base of the reaction rate at different temperatures and constant supersaturation is constant and equal to the Arrhenius energy of the process provided under highly reduced pressure /in vacuum/.In calculations of the activation energy /at constant supersaturation/ the values of the apparent equilibrium pressures,p_o,have been used, which can be found by extrapolation of kinetic data /decomposition rate/ obtained under different pressures up to such conditions where the reaction practically stops.On the Fig.1 the example of the regularity of thermal dissociation of the first stage have been shown.

Run of the second stage /II/ of decomposition of basic salt in the atmosphere of gaseous products is more complicated, that in vacuum is investigated simultanously dehydratation of compound and involving ammonium.In this case the rate of the reaction , activation energy and coefficient pre-expotential in the Arrhenius equation explaning the summaric process. In the second stage of decomposition of basic aluminium ammonium sulfate providing under water vapour, general regularities of thermal dissociation of the solid states at the 623-743 K temperature, is observed. In the temperature more than 743 K the influence of water vapour on the run of the process is not observed.At the temperature about 600 K takes place an initial disulfarazation of compound.In the second stage /II/ the dissociation of basic salt in the atmosphere of ammonium runs in two steps.In the initial step the decomposition runs according to the general regularities of thermal dissociation of the solid states.In the final stage of the process providing in the ammonium atmosphere, where the rate of the reaction limits the rate of gaseous diffusion of reaction product by increasing solid layer of the product the general regularities are not observed.

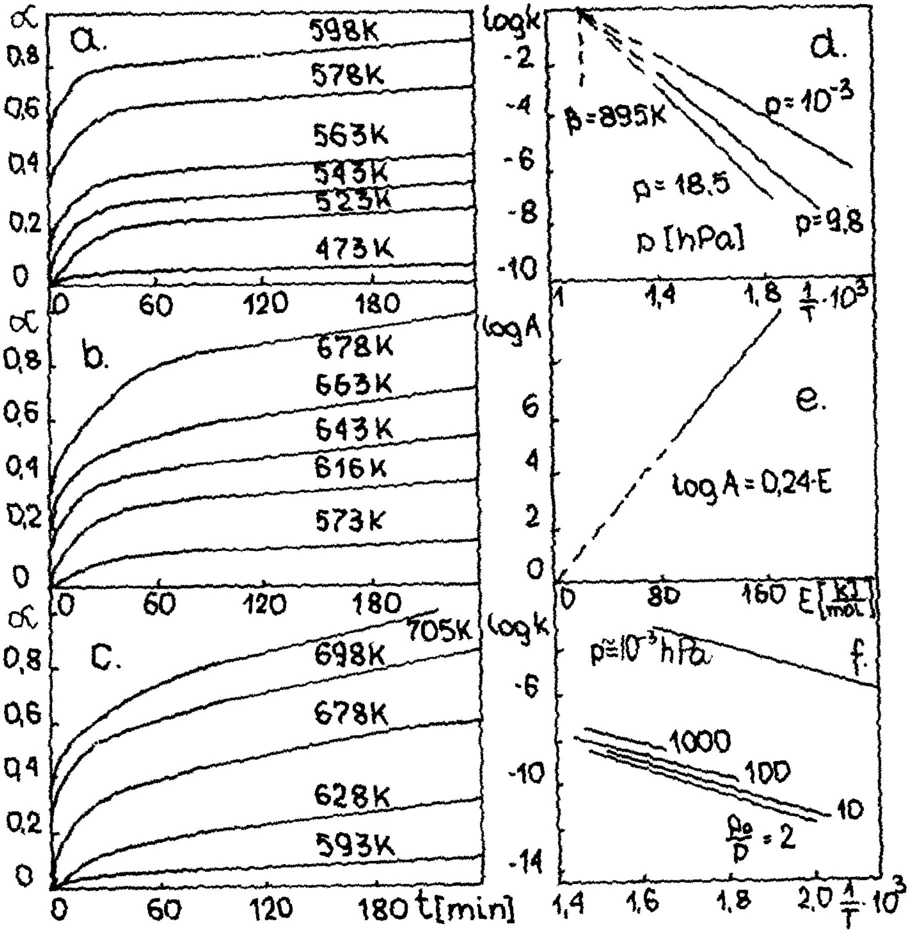

Fig.1. The first stage /I/ of thermal dissociation of basic aluminium ammonium sulfate in the atmosphere of water vapour

Kinetic curves: $p \cong 10^{-3}$ hPa/a/, $p_{H_2O}=9,8$ hPa/b/, $p_{H_2O}=18,5$ hPa/c/

The Zawadzki-Bretsznajder relationships /d/

Compensation relation /e/

Relation log $k=f/1/T/$ for various values of p_0/p/f/

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