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Thermogravimetric analysis of ammonium-iron(II) sulphate

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Abstract

Kinetics of thermal decomposition of ammonium-iron(II) sulfate was studied by thermogravimetric analysis (TGA) in dynamic and isothermal condition in the atmosphere of own vapors. TGA was carried out on ATB-14M automatic thermobalances. Studies have shown that the process of thermal decomposition of a double salt in a dynamic conditions mode with a constant rate of temperature rise consists of five successive temperature stages.

We used the Redfern-Coates method to establish the order of the reaction and calculate the effective kinetic parameters for each of the five consecutive temperature stages determined by the differential line. We calculated effective kinetic parameters of the thermal decomposition for each temperature stage – the reaction order, the activation energy, the pre-exponential factor of the Arrhenius equation and the coefficient of linear correlation. By IR spectroscopy solids were studied at each of the complex decomposition temperature stages. Based on the analysis the magnitude of the mass loss rate and the study of changes in the IR spectra of the solid products of the thermal decomposition of the complex, at each kinetic stage of the dynamic conditions, volatile products were isolated at each stage and a thermal decomposition scheme for the complex iron(II).

It has been established that decomposition process of double salt in isothermal conditions was adequately described by kinetics models of topochemical reaction Kolmogorov-Erofeev, Garner-Prout-Tompkins, Roginskii-Schultz, because, at a minimum, one of the final products of thermal decomposition has a pronounced crystalline structure. Has been established that the process of thermal decomposition of ammonium-iron(II) sulfate under isothermal conditions proceeds through two temporary stages.

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