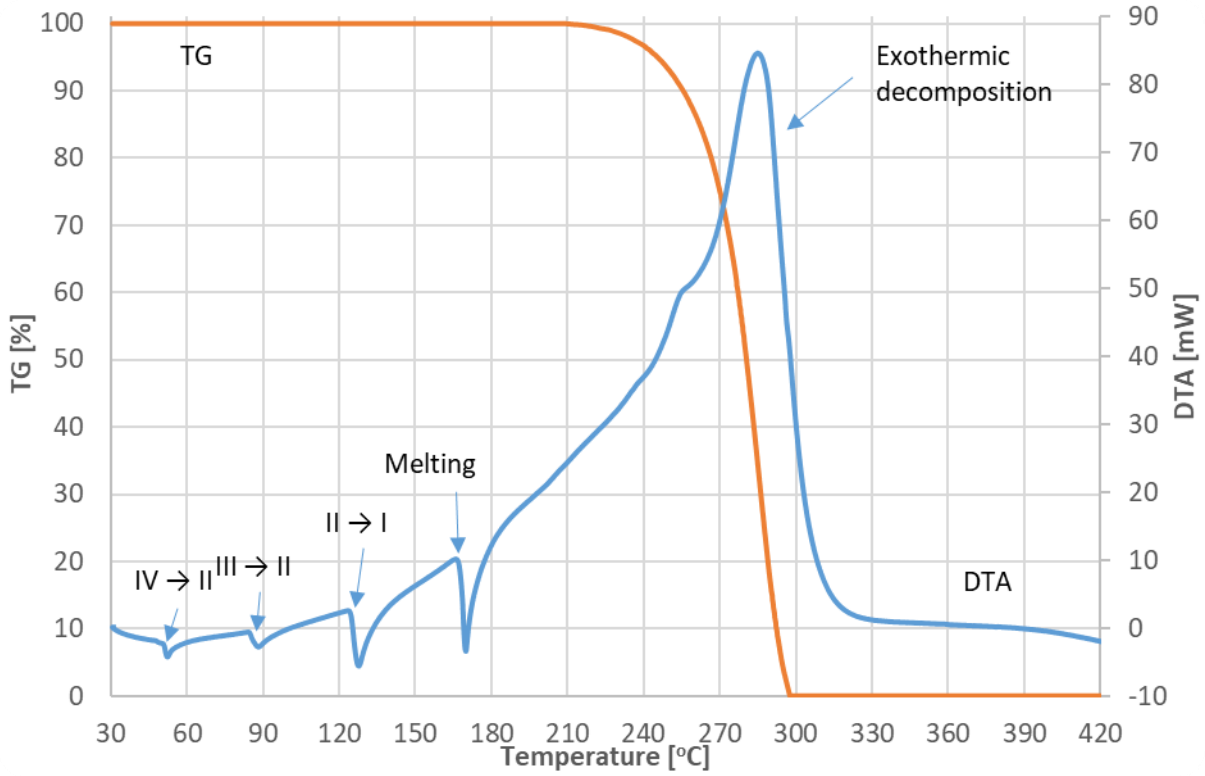
The aim of the proposed research is to study the influence of mass and heat transfer conditions on the decomposition kinetics of pure ammonium nitrate and its mixtures with urea and boric acid in different mass ratios. Thermal stability is going to be determined with the use of various methods, which will allow for the analysis of phase transitions and thermal decomposition of samples. Ammonium nitrate is used mainly as a component of mineral fertilizers due to its high nitrogen content that is accessible for plants. Above 200°C, ammonium nitrate undergoes thermal decomposition with creation of a lot of heat, what is a reason for its use in explosive materials production and as a novel propellant that does not generate any harmful byproducts during its decomposition.



DTA-TG measurement results of ammonium nitrate sample, mass loss and phase transitions together with exothermic decomposition can be seen on TG and DTA curves, respectively.

Studied systems will be subjected to differential thermal analysis and thermogravimetry coupled with mass spectrometry in opened and covered crucibles. This method will allow for measurements of sample temperature changes and mass loss in a set temperature program. Analysis of gas products generated as a result of sample heating will allow for a more detailed description of chemicals reactions occurring in the system. Afterwards, measurements will be made with the use of a scanning calorimeter with simultaneous measurements of pressure in sealed vessels containing samples. The final stage of the research will be based on calorimetric analyzes in adiabatic conditions, i.e. no heat exchange between the heated sample and surroundings. Such measurements will be a very good simulation of transportation and storage conditions of significant masses of mixtures containing ammonium nitrate, urea and boric acid.

Obtained results will allow for a determination of whether there is a risk during use, transportation or storage of mixtures containing ammonium nitrate, urea and boric acid in appropriate mass proportions. The performed research will allow for a detailed description of the observed decomposition kinetics in various conditions, such as accumulating pressure, adiabatic conditions or a limited mass transfer. The acquired knowledge will enable avoiding dangerous situations or accidents that could be caused by the uncontrolled decomposition of above-described systems. The use of a combination of above-mentioned research methods will serve as an example of the appropriate choice of methodology for testing similar systems.