

In June 2019 European Parliament and the Council of European Union adopted the new Regulation laying down rules on the making available on the market of EU fertilizing products. The Regulation harmonized the requirements for fertilizers produced in the EU and set consistent limits for a range of contaminants, such as cadmium, contained in mineral fertilizers. Cadmium is a major problem in phosphate fertilizer branch, as cadmium compounds are always present together with phosphorus in minerals. New cadmium content limits are significantly lower than previously established in most member countries. Those restrictions are threatening the feasibility and profitability of fertilizer industry and force manufacturers to search for new ways of fertilizers decadmiation. Calcination and solvent extraction are two basic methods for this purpose present in the literature. Neither of them is currently used in the industry due to high costs. Calcination of phosphate ore is a well-known method for beneficiation of the ore. Although it is very energy demanding and therefore not economically justified in most cases, some reports have shown that it can significantly lower cadmium content in the ore. The process can be further enhanced with additives (e.g. Cl⁻ ions) that lower the required calcination temperature.

The aim of the proposed research is to study the process of phosphate ore decadmiation by calcination. Phosphate ore samples will be prepared by two methods – by simple mixing with solid inorganic salts and by ore impregnation in inorganic salts solutions. Prepared samples will be calcined in different calcination regimes (temperature, time) in accordance with the prepared experiment matrix. Obtained products will be digested and the cadmium content then measured. Mathematical models describing the process will be derived using professional result analysis software and the best parameters selected. Studied systems of phosphate ore with additives will be also subjected to differential thermal analysis and thermogravimetry coupled with mass spectrometry. This method will allow for better understanding of processes occurring during the phosphate ore calcination.

The implementation of all stages of the research will allow for an increase in knowledge in the field of phosphate ore decadmiation. Newly introduced European Union fertilizer regulation may force fertilizer manufacturers to implement some solutions in order to fulfil cadmium content limits. This is an area where it is still necessary to study additional and develop existing methods. The research proposed in the application has not been extensively described in the literature so far and will allow for better understanding of the calcination of phosphate ore under various conditions.