

UREA PHOSPHATE AS A COMPONENT OF COMPLEX NPCa-FERTILIZERS

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The use of mineral fertilizers is one of the main criteria for increasing yields in agriculture. Complex fertilizers, which contain both nitrogen and phosphorus, are of particular importance. To provide agriculture with complex fertilizers, technologies based on the use of phosphorus-containing raw materials, which are located in Ukraine, are promising. Of particular practical interest is the use of carbamide due to its ability to form complex fertilizers with almost all inorganic acids and salts. This contributes to the production of complex fertilizers with various forms of nutrients, which slowly decompose under the action of soil solutions or water, which leads to the transition of phosphates fixed in the soil to assimilable ones.

The study of the interaction of urea with various salts and acids is of both theoretical and practical importance in connection with the production of complex fertilizers. Urea is the most nitrogen-rich fertilizer; it contains 46.6 % nitrogen in an easily assimilable form. It has the ability to form crystalline inclusion compounds with both organic and inorganic compounds. Urea inclusion compounds are highly stable. With acids, urea forms in the process of hydrolysis easily dissociating crystalline salt-like compounds having an acidic reaction.

In this regard, it is of interest to obtain carbamide phosphates depending on the concentration of phosphoric acid. The studies were carried out using analytical grade reagents ($\text{CO}(\text{NH}_2)_2$ and H_3PO_4). The general procedure for the preparation of carbamide phosphate was as follows: crystalline carbamide was slowly added to a solution of orthophosphoric acid with a concentration of 80 %. Then, at a temperature of 40 °C, the mixture was stirred at $\tau = 30$ min. Then the hot solution was filtered using a Buchner funnel. The resulting filtrate was cooled to 0 °C and sent again for filtration using a Buchner funnel. As a result, a solid fraction was obtained – crystals of carbamide phosphate ($\text{CO}(\text{NH}_2)_2 \cdot \text{H}_3\text{PO}_4$).

The obtained samples of carbamide phosphate were subjected to X-ray analysis, as a result of which the composition was established, which fully coincided with the literature data. The X-ray diffraction pattern of carbamide phosphate is shown in Fig. 1.

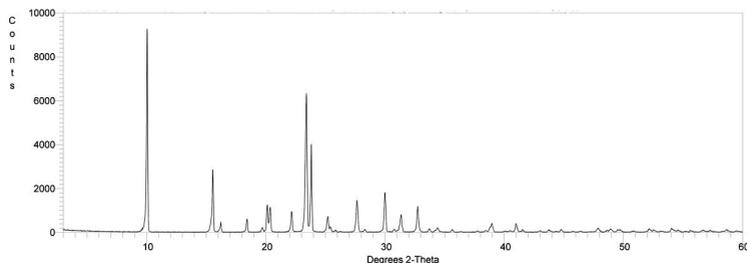


Fig. 1. X-ray diffraction pattern of urea phosphate

The optimum concentration of phosphoric acid (H_3PO_4) for the production of carbamide phosphate is 80 %. Because at a given concentration, moisture loss occurs faster than at higher concentrations.