UTILISATION AND RESYCLING OF PHOSPHOGYPSUM WASTES

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New inventions and processes have been continuously developed to improve our way of life. Technological advanced help us but many of them also bring about harm to the environment. Ukrainian economy is characterized with great power consumption and a lot of different wastes. The whole weight of all wastes is above 32 billion tons. Most of our rivers and lakes are so badly polluted that they may not be able to regain their health even if all pollution is stopped. Some soil has been eroded to support crops any more. Restrictions can be placed on the use of the materials that pollute.

The environment in Sumy region is endangered by such chemical by-product as phosphogypsum($CaSO_4 \cdot 2H_2O$). It is formed in the course of processing phosphate ore under the influence of sulfuric acid during mineral fertilizers production. Phosphogypsum is obtained in the course of phosphoric acid production, as a result of reaction phosphate (apatite) and sulfuric acid according to the following:

$$Ca_5(PO_4)_3F + 5H_2SO_4 + 2H_2O \rightarrow 5CaSO_4 \cdot 2H_2O + 3H_3PO_4 + HF$$

For each ton of phosphoric acid about 4,3-5,8 tons of phosphogypsum by-product are obtained. The world production of phosphoric acid is about 22 million tons of P_2O_5 and thus the quantity of phosphogypsum is about 100 million tons. There are about 200 million tons of phosphogypsum in Ukraine. It is stored on open stacks influenced by downfall. The problem of its recycling and utilization is especially urgent for our city as Sumykhimprom has stored about 15 million tons of this harmful by-product in the outskirts of a large town.

Much scientific research has been carried out and many methods have been patented but only a few of them have been put into practice. Due to its crystal structure phosphogypsum consists almost 95% of $CaSO_4 \cdot 2H_2O$, one of the methods of its utilization is the conversation to plaster and plaster products. It's characterized by process of thermal (170^0 C) dissociation of dihydrate to hemi-hydrate according to the following reaction:

$$CaSO_4 \cdot 2H_2O \rightarrow CaSO_4 \cdot 0{,}5\,H_2O + 1.5H_2O$$

Obtained plaster is usually used for the production of cement, wall boards, gypsum plasterboard and other gypsum building materials.

My current research deals with the study of optimum parameters in all stages of phosphogypsum conversion and down-grading the contents of P_2O_5.

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