PHOSPHORUS GYPSUM PROCESSING INTO POLYMINERAL GYPSUM BINDING MATERIALS BY MEANS OF CHEMICAL DEHYDRATION

M.I. Kuzmenkov, N.G. Starodubenko, A.A. Sakovich, O.V. Belanovich
"Belerusian state technological university", e-mail unibel.chtvm@tut.by,
L.Yu. Moskvin
"InnoTeka", e-mail moskvin@mail.ru

Gypsum binding materials are characterized by lower energy consumption for their manufacturing in comparison with other types of mineral binders. But there was not much attention paid to this quality in former times because energy sources were cheap enough. That's why most types of building materials were produced on Portland cement base and energy consumption for its production are approximately 5 times higher than those of gypsum cement. In Germany the production of gypsum binding materials comprises 25-27% from total volume of mineral binding materials, this allows to reduce Portland cement volume which is very energy-intensive in production. In Russia, production of gypsum binders comprises 5 % from total volume of binding materials production. Share of gypsum binders comprises 1% from total volume of cement and lime produced in the Republic of Belarus. Considering the fact, that energy consumption for producing of gypsum binders is lower than that of Portland cement, reasonability of expansion of their production is obvious.

The use of natural gypsum rock as a raw material for producing gypsum binders is prevailing today, but because of the lack in natural gypsum rock it is promising to involve technogenic waste - phosphogypsum - as a raw material for producing of gypsum binding materials.

The lack of manufacturing of gypsum binder in the Republic of Belarus makes impossible increasing output of gypsum plasterboards, which are the most important type of building materials.

In comparison with neighboring states Belarus is not in very favorable situation in manufacturing gypsum plasterboards. In the Republic of Belarus the average share of gypsum plasterboards is 1 m^2 per person; in neighboring states this share is 3 times higher.

Phosphogypsum - is inevitable large-capacity waste from production of extraction phosphoric acid. About 100 million tonnes of phosphogypsum are made in the world annually, and practically all this amount (99%) is spoilt or thrown down to the sea. In Russia 11 million tons of this kind of wastes is formed annually. According to the content of main component, phosphogypsum is considered to be the 1^{st} grade raw material. The level of phosphogypsum use in Russia in former years reached 2, 5 million tonnes per year.

Today there have been developed various ways of phosphogypsum processing into gypsum binding materials. This problem can be solved from the technological point of view, but economically, these ways do not stand competition in comparison with traditional ways of producing of gypsum binding materials from natural gypsum rocks.

From our point of view, the brake in this field can be done in case of avoiding thermal methods of gypsum binding materials manufacturing.

In dumps of public corporation "Gomel chemical plant", area 130hectars, there have been deposits of 20 million tonnes of phosphogypsum, and its annual increase will be about 700-750 thousand tonnes.

In this connection, it is actual to reduce its further accumulation in cause of large capacity technology of fresh phosphogypsum processing into gypsum binders and regulator of setting terms of cement.

Reasonability of phosphogypsum use as raw material for binder's production is determined by the absence of natural gypsum rocks in the Republic of Belarus, and its import meets the demands of the country.

Cost price of 1 tone of gypsum binder produced from phosphogypsum will be 2 times lower than that of from imported natural gypsum rocks.

Besides, for manufacturing gypsum binders local raw materials will be used, and its processing by means of effective dehydrating means don't require thermal energy consumption.

The need in natural gypsum rock for gypsum binders manufacturing is about 105 thousand tons.

According to the current law, public corporation "Gomel chemical plant" annually pays ecological tax of 500 $ for stacking phosphogypsum. Besides, plant expenses on exploitation of nature protected objects and environmental protection measures are about 5 million 500 thousand $ annually.

At the department of chemical technology of binding materials of BSTU, research investigations for development phosphogypsum processing technology into gypsum binders have been carried out.

Using sulfuric acid as dehydrating means, there have been developed technological parameters of chemical dehydration of phosphogypsum at Gomel chemical plant and Voskresenski SPA "Minudobreniya". It is determined, that obtained mixed gypsum binding material is normal hardening and has water demand 0, 5, softening factor 0, 37; its strength properties are equivalent to gypsum cement G13 - G15 and can be used for self-levelling floors. Technological process is characterized by simple equipment, absence of gas and hard wastes.

For completing perspective researching investigations, scientists of Belarusian state technological university invite interested organizations for mutually beneficial cooperation.