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Ways of Utilization of Dust from Cement Plants

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ABSTRACT

The article discusses the properties of crushed stone-lime asphalt concrete and the conditions for obtaining a high-quality road surface during its application. The results of the study of replacing mineral powder in crushed stone-asphalt concrete with dust, dust from cement plants and dust from pyrite slag, as well as a study of the stability of the quality of bitumen in time to normal and high temperatures are described. However, the selected areas of using cement plant dust cannot be considered particularly promising, since in the above methods, cement plant dust is easily replaced by chalk and limestone. In this regard, it is more promising to use dust from cement plants to obtain nitrogen-calcium fertilizers, mainly containing calcium nitrate.

KEYWORDS: *Dust cement, asphalt concrete, a piece of chalk, granular phosphogypsum, phosphogypsum*

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Dust from cement plants is used as a component of cement slurry for cementing oil and gas wells, which contains, wt%: oil well cement 15.8 - 27.5, sodium chloride 3.8 - 6.1, fly ash containing CaO + MgO from 6.66 to 9.60, dust of clinker kilns of electrostatic precipitators, from waste gases of rotary kilns of cement plants 13.2 - 19.3 and water - the rest. Backfill cement, fly ash and dust from cement plants are mixed. The resulting mixture is mixed in an aqueous solution of sodium chloride. Dust from cement plants acts as a setting regulator. Regulation of the duration of structure formation and hardening of cement slurries is achieved by using known retarders for setting and thickening, which are products of special chemical production or some waste of chemical processing of raw materials. The nature of their interaction with cement, in general terms, is reduced to adsorption on cement particles and to blocking the active centers of the particles, which slows down hydration.

Known raw mixture for producing agglomerated phosphogypsum containing, by weight. %: phosphogypsum (in terms of dry dihydrate) 30 - 35; phosphemihydrate (in terms of dry hemihydrate) 40 - 45; dust of clinker kilns of cement plants - the rest. Compression strength of agglomerated phosphogypsum in the early stages of hardening 2.0 - 2.4; water resistance 78.0 - 79.4%. Known raw mixture for the production of building materials, which contains 24 - 35 wt. % decarbonized dust of clinker kilns of cement plants - carryover, 10 - 20 wt. % of cement plant dust - carryover, 1.5 - 2.0 wt. % natural soda concentrate, sand - the rest. EFFECT: increased compressive strength, reduced cost of construction products obtained from the proposed raw mixture, and reduced time required for the manufacture of these products, increased the amount of used dust from cement plants - runoff. Also known is a raw mixture for the production of building products, including lime, sand and dust of cement plants - carryover, additionally contains a natural soda-containing concentrate with the following ratio of components, wt. %: lime 4 - 5, cement plant dust - carryover 10 - 30, natural soda concentrate 1.5 - 2.0, sand - the rest.

Dust from cement plants is used for cementing oil and gas wells, while the spacer fluid contains cement, clinker kiln dust, clay powder, polymethacrylamide and water.

A known composition for isolating formations, liquidating losses and cementing wells, which contains wt.%: Cement 28.8 - 43.7, cement production waste from calcium - magnesia limestone - dust from cement plants, captured by electrostatic precipitators from waste gases, 6.1 - 14.1, clay powder 4.0 - 19.1, cationic polyelectrolyte VPK - 402 based on quaternary ammonium bases 0.2 - 0.5 and water - the rest. Dissolve in water VPK - 402. Cement, dust of cement plants and clay powder are mixed with the resulting solution. Characteristics of the composition: a lightweight solution is obtained that forms a stone, with high strength and insulating properties, due to a high coefficient of expansion and low permeability. Dust from cement plants is used to produce granular phosphogypsum. Granular phosphogypsum is used as a regulator of the setting time of cement and other binders, instead of natural gypsum stone. The essence of the method lies in the fact that the raw

mixture, consisting of phosphogypsum and dust of cement plants, is subjected to pressing and pelletizing, and then the surface of the granules is dusted with a fine mineral powder having a specific surface area of 300-500 m2 / kg. As a mineral powder, dust from electrostatic precipitators of rotating cement kilns or ash is used - the entrainment of TPPs. This achieves a complete neutralization of acid residues contained in phosphogypsum, a high initial strength of the granules is achieved, and their transportability is improved. The invention can find application in cementing rocks, for repair and construction work to strengthen buildings and structures, in the construction of tunnels. The technical result is an increase in the stability of properties and a reduction in the cost of production of highly penetrating cement grouting slurries. The grouting slurry contains, wt%: dust from cement plants with a specific surface area of 900 - 2000 m2 / kg 15 - 30, silica fume with a specific surface area of 900 - 2000 m2 / kg 2 - 10, superplasticizer C - 3 0.3 - 0.6, water is the rest.

In the works, the possibility and prospects of using cement production waste (dust from electrostatic precipitators) in glassmaking have been assessed. It is shown that the introduction of 5 to 15% of dust into the charge makes it possible to completely exclude sodium sulfate and chalk from the composition of the charge. An increase in the content of fine dust in the charge intensifies sintering and favors an increase in the specific surface area of the charge and the strength of the pelletized samples. At a fixed processing temperature, as the dust content increases, the weight loss decreases.

It is also proposed to use dust from cement plants for the production of sand-lime bricks. It is shown that the dust from the drift of cement kilns can be used for the manufacture of dense fine-grained concrete and foam concrete.

The paper presents the experience of the technology of road surface repair in Germany. The features of crushed stone-mortar asphalt concrete and the conditions for obtaining a high-quality road surface during its application are considered. The results of studies on the replacement of mineral powder in the composition of crushed stone asphalt concrete for fly ash, dust from cement plants and pyrite cinders, as well as studies of the stability of the quality of bitumen over time at normal and elevated temperatures are described.

However, the chosen directions of utilization of dust from cement plants cannot be considered particularly promising, because in the above methods, the dust of cement plants can be easily replaced with chalk, limestone.

In this regard, more promising is the utilization of dust from cement plants to obtain nitrogen-calcium fertilizers containing mainly calcium nitrate.

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