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# OBTAINING CEMENT GRINDING INTENSIFIERS

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**Abstract**

*A method of intensification, grinding of Portland cement clinker and components is proposed. raw cement slurry using new surfactants. The optimal option has been installed; the use of surfactants in Portland cement production processes.*

**Key words**

*surfactants, gosypol, intensifier, grinding, cement.*

The building materials industry is an important part of the country's construction complex. In turn, the production of binders (cement, lime, gypsum) and construction products based on them, such as prefabricated reinforced concrete, sand-lime brick, gas silicate blocks, asbestos-cement products, plasterboard sheets, occupies a dominant place among the wide variety of products currently used. building materials [1].

Currently, there are 12 cement plants operating in the Republic of Uzbekistan with a total annual capacity of more than 9.0 million tons. Including large ones - Kizilkumcement JSC, Akhangarantsement JSC, Bekabadcement JSC, Kuvasaycement JSC, Jizzakh Cement Plant, - and differs from some other manufacturers in high quality and is deservedly popular not only in Uzbekistan but also in many foreign countries. These days, the production of building materials is being improved and developed very dynamically, as the construction industry constantly puts forward ever higher demands on their quality. This places high demands on the level of knowledge of a chemist and technologist involved in the development of technologies for the production of binders, since the complex of operational properties of building materials serves as a kind of “feedback” in building materials science.

The cement production process is quite complex and labor-intensive. It requires special equipment and compliance with technological standards and conditions. All this affects the final cost of cement [2].

The article will discuss the features of preparing cement in factory and laboratory conditions, and also discuss the equipment necessary for this. Scientific achievements relate to the construction materials industry, in particular to the production of cements and the technology of their grinding. The technical result is an increase in the level of influence of non-functional organic compounds in the grinding intensifier on the grinding process of cement clinker, an increase in the grindability of clinker, a decrease in the aggregation of cement clinker particles and their adhesion to grinding surfaces. The cement grinding intensifier contains silicon and organic compounds.

To control the process of cement structure formation and regulate its physical and technical properties, the use of organic compounds, which are waste oil from fatty factories, as part of the grinding intensifier.

In our developments, to obtain grinding intensifiers, we use the bottom residue from the production of cottonseed oil - gossypol resin (cotton tar). Cotton soap stock contains neutral fat, fatty acids, gossypol and its oxidation products, interaction with proteins, phosphatides and fatty acids. The presence of gossypol and its transformation products in cotton soap stock makes it difficult to use the latter in the soap industry due to unpleasant complications during soap storage (darkening).

To separate fatty acids from the above products, crude fatty acids isolated from cotton soap stocks are distilled. The bottom residue from such distillation is gossypol resin (cotton tar).

The yield of gossypol resin in relation to crude fatty acids released from cotton soap stocks is 18-20% [3-4].

Gosypol resin is a homogeneous viscous mass from dark brown to black, insoluble in water, soluble in petroleum distillates and organic solvents.

Gossypol gum contains from 52 to 64% free fatty acids and their derivatives. The rest are products of condensation and polymerization of gossypol, as well as products of its transformation formed during the growth of oil, mainly obtained during the distillation of fatty acids from soap stocks [5].

Based on the distillation of fatty acids from all soap stocks obtained from the refining of cottonseed oils, it is possible to obtain up to 15,000 tons of gossypol resin per year.

In table 1. The indicators of gossypol resin from the Kattakurgan oil and fat plant are shown.

Table 1.

| | Kattakurtan MZhK | |
|---|---|---|
| | I mode | II mode |

| | | |
|---|---|---|
| % organic substances | 97,29 | 98,66 |
| % inorganic substances | 2,71 | 1,34 |
| %gasoline-soluble substances | - | - |
| % fat-soluble substances | 100 | 100 |
| % water-soluble substances | - | – |
| Acid number in mg KOH | 65,3 | 5,0 |
| iodine number (according to Galus) | 99 | 53 |
| Saponification number in mg | 199 | 171.7 |
| Essential number in mg KOH | 134 | 121,7 |
| Hydrophilic number | 91 | 84,2 |
| Molecular weight (by cryoscopic solvent-dioxane method) | 525 | - |
| % acetone-soluble part | 77.5 | 83,0 |
| % acetone-insoluble part | 22,5 | 17.0 |
| % fatty acids released during saponification | 64,0 | 61,0 |

The high ester numbers given in this table indicate the presence of lanthanes in gossypol resin [6].

The large difference in saponification numbers and acid numbers also indicates the transformation of an altered form of gossypol under the action of an alcoholic alkali.

Considering the presence of nitrogen, it is possible to assume the presence of condensation products of gossypol with protein substances. The molecular weight of gossypol resins indicates that they contain copolymerization products.

**Quality indicators of gossypol resin**

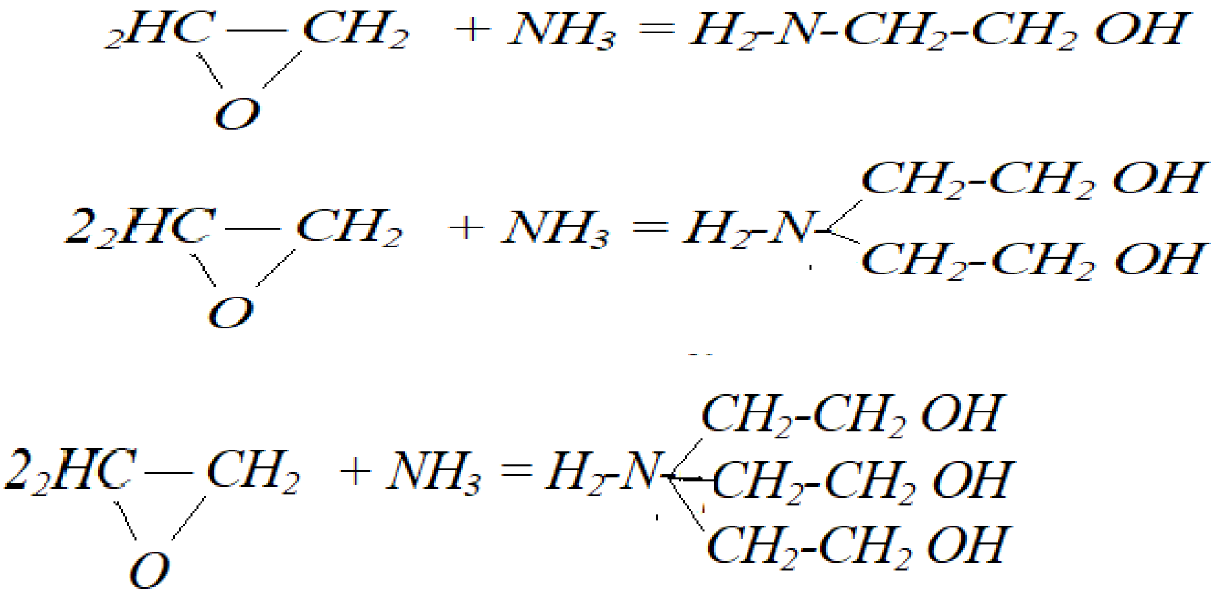
Table 2

| Appearanc | View 1 | View 2 |
|---|---|---|
| | Homogeneous viscous mass from dark brown to black color | |
| Acid number, mg KOH | 70-100 | 50-70 |

| | | |
|---|---|---|
| Solubility in acetone, % not less than | 80 | 70 |
| Ash content,% not less than | 1.0 | 1.2 |
| Moisture and volatile matter content, % no more than | 4.0 | 4.0 |

To modify gossypol and increase its solubility in water, treatment with triethanolamine was carried out. technical triethanolamine

When interacting with ammonia, the standard oxide forms ethanolamines [7]:



Triethanolamin

Technical triethanolamine is fire hazardous, low toxic, and has alkaline properties [8].

Flash point 232 $^{0}$C, ignition temperature 395$^{0}$C. Technical triethanolamine, in terms of the degree of impact on the human body, as a moderately hazardous substance, belongs to hazard class 3 according to GOST I2.1.007-76.

In experiments carried out to determine the effect of additives on the grinding process of cement clinker, Portland cement clinkers from the Akhangaran cement plant and the Angren building materials plant and limestone from the Akhangaran deposit were used.

**MATERIALS AND METHODS**

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When performing experimental work, along with the generally accepted methodology and equipment widely used in practice, some special instruments and research methods were used.

All instruments and laboratory equipment used in the research were tested by the Republican Laboratory of the State Supervision Committee of Standards, Measures and Measuring Instruments.

Determination of the grindability of clinkers and limestone was carried out on a laboratory two-chamber ball mill brand 40T-ML as follows: limestone or clinker was pre-crushed in a jaw crusher and its fraction of 2-7 mm in size was selected by sifting through a sieve. The additive was introduced into the mill before grinding, in the form of an aqueous solution in an amount of 0.015 to 1% by weight of the dry matter (in terms of dry matter) in a finely dispersed (sprayed) state.

The grinding duration, the amount of crushed material (8 kg, 4 kg in each chamber) and the weight of the grinding media (32 kg) were always constant.

After the specified grinding time, the remaining material on the control sieves and the specific surface area were determined.

The plasticizing ability of surfactant additives was determined by changing the melt of a 1:3 cement mortar cone on a standard shaking table according to GOST 310-76.

Mixing of cement mortars was carried out in a laboratory mixer of the ML-IA type with a bowl speed of 20. Standardization of beams of cement mortar measuring 4x4x16 cm was carried out on a vibrating platform type 435 A with a vibration amplitude of 3000-200 per minute.

Bending testing of beam samples was carried out using an MII-100 device. Determination of the compressive strength of the samples was carried out on a PT-100A hydraulic press with a maximum load in the range of 1.0-2.5 tons.

The numerical values of the strength of cement mortars given in the tables and figures are arithmetic averages from series 4-6 of experiments.

In addition to these studies, the surface and volumetric properties of aqueous solutions of the resulting surfactants were determined using the stalagmometric method and the specific electrical conductivity method.

Thus, the research methods used in the work corresponded to typical modern laboratory analysis and made it possible to consider the obtained experimental data to be quite objective.

RESULTS

Obtaining new surfactants to intensify the grinding of limestone and Portland cement clinkers; Concrete, cement mortars and products made from them are

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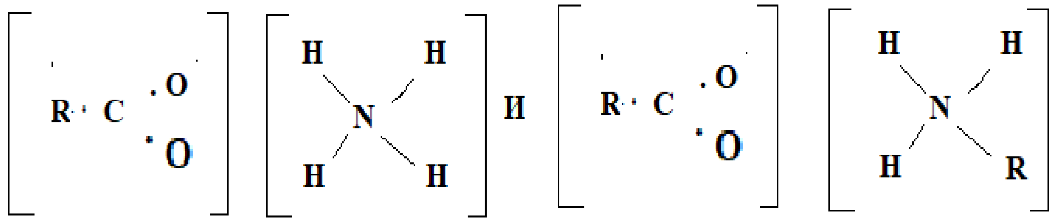
capillary-porous bodies and are hydrophilic in nature, i.e. being in contact with water, they absorb it. The consequences arising from the harmful effects of water, as well as from the alternating freezing of moistened concrete and its thawing, in some rare cases, become obvious after 5-6 years.



Consequently, when fatty acids react with amino alcohols, complex salts of fatty acids are formed

R-COOH+ $NH_2C_2H_4OH \rightarrow RCOONH_3C_2H_4OH$

R-COOH+ $NHC_2H_4OH)_2 \rightarrow RCOONH_2(C_2H_4OH)_2$

R-COOH+ $N(C_2H_4OH)_3 \rightarrow RCOONH(C_2H_4OH)_3$

In our case, free fatty acids, which are contained in gossypol resin, interact with technical triethanolamine and form a complex fatty acid salt of the following type:

R-COOH + $N(C_2H_4OH)_3$ *RCOONH*$(C_2H_4OH)_3$

**CONCLUSIONS**

The resulting product is water-soluble, has a certain hydrophobic-lyophilic balance and can be used to intensify the cement grinding process.

Our substances synthesized in this way showed surface activity and all the regularities characteristic of low-molecular-weight surfactants, which allows us to expect a dispersing effect from them.

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