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Reinforcing in the Production of Gypsum Materials on Base Wollastonite Fibers

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Abstract: *There are given properties of testing in nano-lab-testing and using it in gypsum materials nowadays. The addition of wollastonite to the gypsum is carried out as follows: it is poured into the dry consist and mixed. Thus, the addition of wollastonite reduces shrinkage deformations and improves the technological properties of dry mixes.*

Keywords: *wollastonite, dry mix, gypsum, crack, composite*

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Micro-reinforcing properties of wollastonite, natural calcium silicate, allow it to be effectively used in the production of paints and dry mixes. As micro-reinforcing properties of wollastonite, provide dimensional stability manufactured with its use of materials is the property most desired in the production of dry building mixes (DBM) for various purposes, drying which is the problem of various-shrinkage is particularly acute. Natural mineral, the so-called wollastonite is a natural calcium silicate of white or light gray color with the chemical formula $CaSiO_3$. Wollastonite - formed in the presence of insoluble residue Cao and SiO_2 (fig.1).

Materials:

With good adsorption properties, it eliminates the formation of high, which is especially important when using decorative, colored mineral and organic pigments mixtures. Micro-reinforcing properties of wollastonite and high adhesion to surfaces provide increased strength characteristics of gypsum building mixtures and the value of their strength of adhesion to the surface[1]..

On multiple studies and in modern practice in the construction industry to improve dimensional stability, minimize cracking, give dimensional stability and to improve the mechanical performance of various products and composite materials, manufactured based on Portland cement, aluminous cement, anhydrous gypsum, use different types of reinforcing fibers of inorganic (organic) nature.

Fig.1. Type of wollastonite

The main quality of wollastonite, it does not dissolve in water and organic solvents, but interacts with hydrochloric acid. For natural wollastonite characteristic elongated along the length of the crystal structure, while cracking the grain which the formation of acicular form (fig.2).

Methods:

The needle shape of wollastonite grain determines the main direction of its use as a micro-reinforcing filler [4]. Wollastonite is the only pure white filler having the form of columnar oblong crystal with the ratio of fiber length to its diameter depending on the brand (L:D) from 3:1 and above (tabl.1.).

Technological parameters of wollastonite [1-5]

table 1

№	Characteristic	Factor
1	HardnessonscaleMoos	4,5-5,0
2	Density, g/sm^3	2,8-2,9
3	The Alkaline factor, pH. 10% water suspension	8,5-10,5
4	Naturalmoisture, %	0,1-0,5
5	Bulkmass, kg/m^3	1000-1500

Acicularity is the defining property for the hardening of the coating films and coatings for enhancing their durability and wear resistance. In connection with the deteriorating environmental situation, it should also be noted that wollastonite is a substitute for substances such as asbestos and fibrous talc [3].

Chemical composition of wollastonite in countries of Asia and in other countries [1-5]

table 2

Oxids	Uzbekistan				Russia		
	Koytash field	Change field	Langar field	Pribaykal field	East field	Aldan field	Bosagin field
SiO_2	38,6	47,28	51,50	51,41	51,70	49,36	52,0
CaO	42,5	46,10	46,90	46,27	47,38	45,81	39,9
Al_2O_3	2,37	1,00	0,05	0,56	0,10	0,58	2,97
Fe_2O_3+FeO	3,60	0,74	0,16	0,30	0,06	1,22	0,52

TiO_2	0,20	-	-	-	-	-	-
MgO	1,60	-	-	0,17	-	0,50	0,60
MnO	0,18	0,14	0,1	0,01	-	0,44	0,14
K_2O	0,40	1,09	0,03	0,14	-	-	0,40
Na_2O	0,25	1,36	-	0,22	-	0,35	0,40
п.п.п	10,30	2,29	1,26	0,92	0,76	1,74	3,07
total	100	100	100	100	100	100	100

The main reserves of wollastonite are concentrated in the Asia countries, China, USA and India. Quite large deposits of wollastonitescarns are known in Mexico, Canada, Finland, Australia, Kenya, Japan, New Zealand, Sudan, South-West Africa and the former Yugoslavia. The main producers of wollastonite are the USA and China (table 2). According to China National Non-metal Minerals Industry Corporation, enterprises Li-Shi Wollastionite Mining Company and Pan Shi Wollastonite Mine Are engaged in the production of wollastonite in the country. The material is exported, mainly to Japan.

According to the compositions, properties and forms of wollastonite particles, the following areas of its application are determined:

-paintwork material;

-dry mixes for various purposes;

-ceramics, porcelain, refractory and acid-resistant materials;

-asbestos cement products (slate, etc.));

-sanitary ware;

-production of composite polymers;

-concrete products.

Results:

Wollastonite-containing dry mixes are recommended for repair and finishing works on any bases: concrete, brick, plaster, drywall, asbestos cement, etc.

It should be noted that a rational selection of raw materials formulations and technological parameters of the production process is required, taking into account the normalized properties of finished materials and products.

A wide range of applications of these mixtures is mainly due to the presence of wollastonite in their composition. On average, the amount of wollastonite supplementation in CCC is about 5-10% of their weight, varying in some limits depending on the purpose and type of material. In the closed form they are very plastic, easy to apply and have good adhesion to various surfaces. Wollastonite increases the water-holding capacity of the closed mixtures, enhances their structure formation and completely eliminates shrinkage during solidification. With good adsorption properties, it eliminates the formation of, which is especially important in the application of decorative, mineral-colored and organic pigment mixtures. Micro-reinforcing properties of wollastonite and its high adhesion to surfaces provide increased strength characteristics of CCC and the strength of its adhesion to the surface [6].

The minimum compressive strength of these solidified mixtures is 15.0 MPa. They are absolutely weather -and frost-resistant, which allows them to be successfully used for external repair and

finishing works, as well as for the repair of facades. These works developed instructions on determining the consumption rate of additives to prepare quality mixes as-

-Manufacture of gypsum products (facade cladding, decorative artificial stone) – 0.39-0.78 kg/m3;

-Dry mixes and plasters – 0,6-0,8 kg/m3;

-Cement-sand screed, paving slabs and other coatings with high load – 1.6-2.7 kg/m3.

Conclusion:

The addition of wollastonite to the mortar is carried out as follows: it is poured into the wet mortar and mixed. Thus, the addition of wollastonite reduces shrinkage deformations and improves the technological properties of gypsum mixes.

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