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The Use Of Surfactants In The Grinding Of Mosaic Floors

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ABSTRACT

The article considers the tasks of developing and improving the technology of grinding mosaic floor coverings using surfactants.

KEYWORDS

Grinding, mosaic floors, technology, surfactants.

INTRODUCTION

Experience with the use of surfactants (MS) in rock drilling has shown that the rate of drilling hard rock increases by 20-60% under the influence of a weak solution of MS (0.01-1%) compared to washing the well with unadulterated water [3.6].

Electrolytes serve as MSs due to their rock-breaking properties. These include chlorinated salts of magnesium, aluminum, and sodium; alkaline electrolytes - soda, sodium alkali, as well as naphthenic and sulfonaphthenic acid soap, rosin soap; technical products containing carbohydrates, etc.

Thus, surfactants can be very economically viable reagents, which are very cheap, sometimes with production waste.

When sanding a mosaic coating, the abrasive, as shown earlier, only binds directly to the marble filler. It is recommended to treat the marble with a surfactant added to the water to speed up the grinding process.

To determine the effectiveness of surfactants in the grinding of mosaic coatings were tested: from electrolytes - calcium chloride ($CaCl_2$), from alkaline electrolytes - soda (Na_2CO_3) and sodium hydroxide (NaOH), from

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organic compounds - sulfanol DS-RAS; from technical products in the bar with sulfite-yeast (SY).

An aqueous solution with a concentration of 0.1% was prepared from all these substances (such a concentration is most common in drilling practice). The smoothness of the mosaic coating using the indicated MSs was studied in a method similar to the method of studying the smoothness of the mosaic coating.

Samples were made from marble pellets from the Almalyk deposit and tested at 5 days of age. During grinding, an aqueous solution of MS is continuously transferred in such a way that it covers the treated surface with a thin layer.

To test the effectiveness of the use of MS in grinding, control samples were also prepared at the same time as the samples being tested. Clean water was used when grinding them.

The results of measuring the grinding time until a layer of coating up to 7 mm thick is obtained are given in Table 1.

Table 1. Five-day mosaic coating was applied to the MSs without grinding time.

Aqueous solution of MC with a concentration of 0.1%	The total thickness of the obtained layers, mm						
	1	2	3	4	5	6	7
Soda	0,82	1,18	7,93	16,9	24,9	38,1	51,3
Sodium alkali	0,84	1,19	8,15	17,3	27,8	42,2	59,6
Sulfanol DS-RAS	0,87	1,20	8,9	18,6	30,9	44,1	64,2
SY	0,89	1,21	9,5	19,8	35,1	55,0	76,5
Calcium chloride	0,91	1,22	9,9	20,5	38,2	59,2	83,1
Water	1,05	1,29	10,9	21,2	41,2	61,1	91,2

From the data in Table 1, the most effective surfactant is soda solution, which reduces the grinding time by 40% when used instead of water. When using sodium alkali solution and sulfanol DS-RAS, the grinding process is about 30% faster.

Rock drilling practice has shown that the highest efficiency is achieved when using MS at a reasonable concentration.

To determine the reasonable concentration of solutions of soda, sodium alkali and sulfanol DS-RAS 0.05 aqueous solutions of MS shown in the grinding of the mosaic coating; 0.1; 0.15; 0.2; 0.5; Concentrations of 1% were prepared. At the same time, 14-day samples of mosaic coating made of marble chips from the Almalyk deposit were sanded to a thickness of 7 mm.

The dependence of the grinding time on the concentration of the aqueous solution of MS is shown in the graph in Figure 1.

As a result, it was found that aqueous solutions of soda and sodium alkali give the highest efficiency at a concentration of 0.1%. When this concentration is increased or decreased, their effectiveness decreases.

The reasonable concentration of an aqueous solution of sulfanol DS-RAS can be assumed to be 0.25%.

The effect of surfactants on the grinding of mosaic tiles of different ages was studied in samples prepared from marble chips from the Almalyk deposit.

Samples were tested at 5, 7, and 14 days of age. Grinding was carried out until a seven-millimeter layer was obtained.

An analysis of the experimental results showed that the time spent grinding using an aqueous solution of 0.1% soda instead of water was reduced by 40%, regardless of the age of the coating.

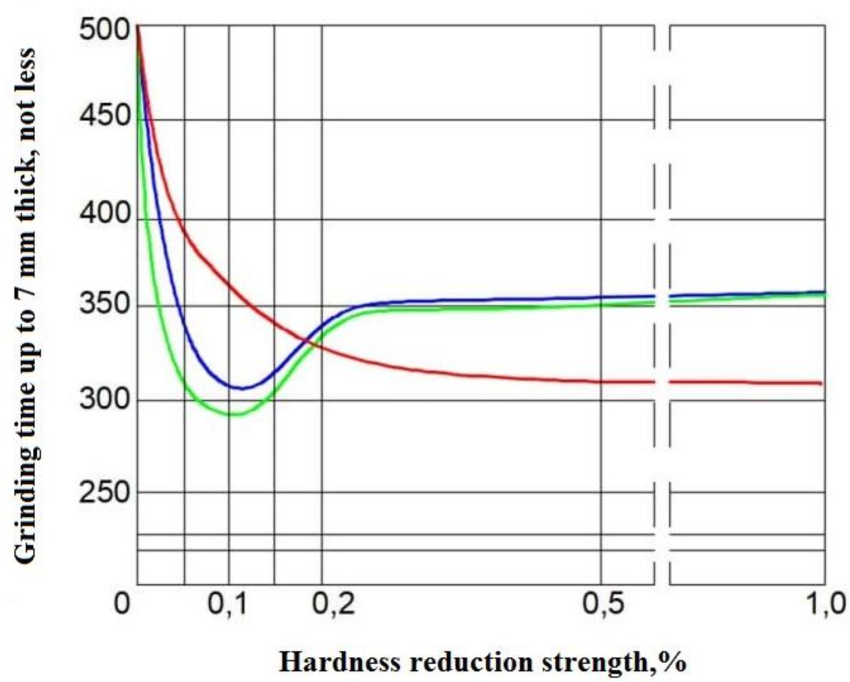

Figure 1. Grinding from the thickness of surfactants (MS)

time dependence.

1 - sulfanol DS-RAS; 2 - caustic soda; 3 - soda

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Grinding of mosaic coatings often depends on the grinding procedure used, i.e. the relative pressure of the abrasive element machine plate and the number of revolutions (frequency).

The graphs in Figures 2, a and b show the relative pressure value of the abrasive plates and the number of revolutions depending on the grinding time of the layer thickness to be removed from the mosaic coating 7 mm. Aqueous solution of water and 0.1% soda was used as the wetting liquid.

In the study of the effect of relative pressure during grinding, the number of revolutions (speed) of the plate remained constant without change - 235 min-1, a value corresponding to the linear velocity of movement of abrasives - 3.25 m / s.

The mosaic cladding samples, as done above, were made from marble slabs from the Almalyk deposit and tested at the age of 5 days.

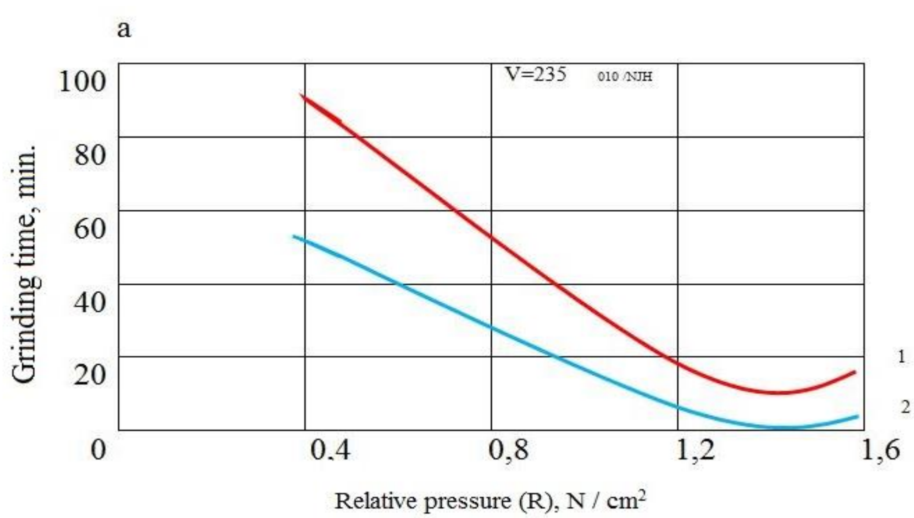
As can be seen from the graphs, the grinding time decreases by 4.5 times as the relative pressure increases from 4 to 12 kPa. Further increase of the relative pressure significantly reduces the grinding time and therefore increasing the relative pressure above 12 kPa is considered inefficient.

Using an aqueous solution of 0.1% soda instead of water reduces the grinding time by 40% regardless of the relative pressure value of the abrasive.

In the study of the dependence of the grinding time of the mosaic coating on the number of revolutions of the abrasive element plate, the relative pressure of the abrasive was assumed to be constant at 4 kPa.

In the case of increasing the rotation speed of the plank, the time spent on grinding the coating is significantly reduced. Therefore, increasing the number of revolutions by more than 475 min-1 (corresponding to a linear velocity of the abrasive of 6.2 sec) proved ineffective, as in this case no significant effect was obtained.

When using a 0.1% aqueous solution of soda, the grinding time was again confirmed to be reduced by 40%, as in the previous case, regardless of the number of revolutions of the machine plate.



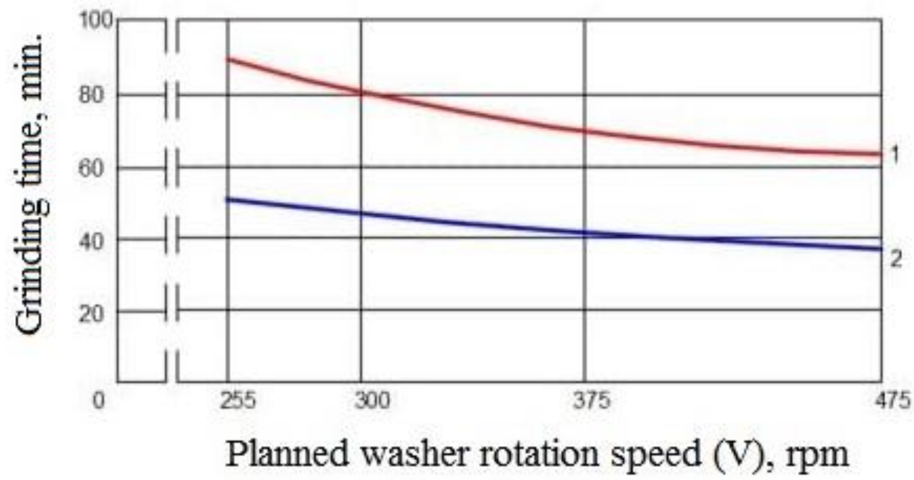


Figure 2. Grinding using different wetting liquids

mosaic flooring depending on the order

grinding time graph

a - is the dependence of the plate on the relative pressure at the rotational speed V=235-1;

b- is the dependence of the rotation speed of the plate with a relative pressure R=4 Pa.

1 - moisturizing liquid - water; 2 - Wetting liquid - an aqueous solution of soda in a concentration of 0.1%.

RESULTS

The results of the study of the intensity of the grinding process showed a specific difference in the process of grinding a mosaic coating from the process of grinding homogeneous objects, and a new hypothesis was introduced into the theory of grinding a mosaic coating as a two-component system. The relationship between the grinding of monolithic (marble) and bisexual mosaic cladding (marble and cement stone) materials was analyzed. Cement stone is sanded using a crushed product of marble and cement stone, which plays the role of free abrasive. According to the basic rules of the theory of abrasive abrasion, it is expedient to use surfactants to increase the efficiency of the grinding process.

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