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THE STUDY OF THE INFLUENCE OF POLISHING BY DIFFERENT METHODS ON THE QUALITY INDICATORS OF NATURAL STONE SURFACES

*Background.*The operating parameters of natural stone products are defined by the state of treated surfaces, their roughness, reflecting ability (gloss), depth of the defect layer. The stone gloss is largely determined by the polishing technology snd namely by the process parameters of fine and superfine grinding-polishing [1 p. 106].

In some cases, the required quality is ensured by superfine diamond grinding operation at the manufacturing of decorative and art goods and jewelry from natural stone. To provide gloss, the protection means and the means of impregnation of natural facing stone are also used. But their impact on treated surfaces is scantily explored.

The aim is to study patterns of influence of polishing by different methods on Pokostovskiy granodiorite gloss.

To process the plates the flat surface grinder was used with the following technical characteristics (Table 1).

Table 1

Specifications of flat surface grinder

Specifications	Value
Water consumption	30 l / min.
The speed of rotation of the head	1460 rev. / min.
The speed of lifting of the head	1.98 m / min.
The speed of the carriage	3.96 m / min.

Fikerts with different numbers and granularity (shown in the table 2) were used as diamond tools. The number of processings by those numbers is also shown. Such scheme of using the diamond tools allows to obtain a high-quality surface of the stone and to ensure its gloss. Gloss of Pokostovskiy granodiorite corresponds the second category as for reflectivity (GOST 9479-84) and is provided by this textured finish.

Table 2

The characteristics of diamond tools

The number of processing	Tool number	Granularity, micron
1	№ 240	200/160
4	№ 400	80/63
2	№ 600	60/40
2	№ 800	40/28

2	№ 1200	28/20
2	№ 1500	20/14
2	№ 2000	10/7
2	№ 3000	5/3
1	Polishing	1/0

Besides automated mechanical processing of the surfaces of Pokostovskiy granodiorites, the polishing powders - oxides of chromium and aluminum were used. The graph of dependence of gloss acquisition on the time of polishing by chromium oxide and aluminum oxide (Fig.1) was formed.

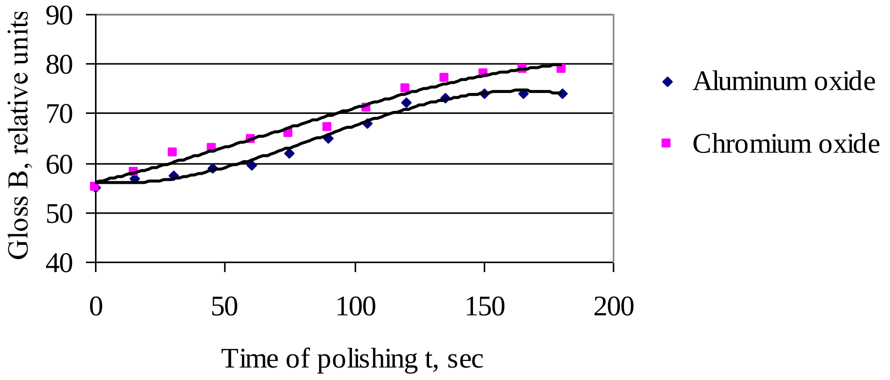

Fig. 1. The graph of dependence of gloss acquisition on the time of polishing by chromium oxide and aluminum oxide

The graph shows that Pokostovskiy granodiorite is better polished by chromium oxide. Marginal stone gloss is achieved in just 165 sec. The stone surface, which polished by aluminum oxide has less gloss and does not change after 150 sec polishing. Depending on the time of polishing by chromium oxide (1) and aluminum oxide (2), the gloss acquisition can be described by the following relationship:

$$B = -3 \cdot 10^{-6} \cdot t^3 + 0.0007t^2 + 0.114t + 56.071 \quad (1);$$

$$B = -10^{-5} \cdot t^3 + 0.0026t^2 - 0.0466t + 56.075 \quad (2),$$

where B - gloss, relative units;

t - time of polishing, sec.

The characteristic feature of Pokostovskiy granodiorite is the variety of colors. Pokostovskiy granodiorite is extracted at 5 quarries, which have differences in the chemical, mineralogical composition and also have different impurities that impact on the color. Blue shades are formed due to the presence of tiny mineral (rutile, ilmenite) and gas-liquid inclusions. Potassium feldspar (microcline and plagioclase) give granitoids red and pink colors, more seldom cream, white and light gray. Plagioclase give granitoids white, light gray and gray to black colors, sometimes greenish, yellowish, and gray-green hue (due to micro-inclusions of green ferruginous silicates). It is related to secondary changes of plagioclases, the formation of chlorite, epidote.

Dark-colored minerals, biotite, hornblende, pyroxene, have little impact on the overall perception of granitoids color, and only if their content is 15-20%, the rocks are gray or dark gray [2 p. 125].

Taking into account the variety of Pokostovskiy granodiorites, and using the proposed classification of stone in color and lightness [3 p. 58], we measured the gloss values of polished stone surfaces at mechanical polishing, depending on the types of Pokostovskiy granodiorite (Fig. 1).

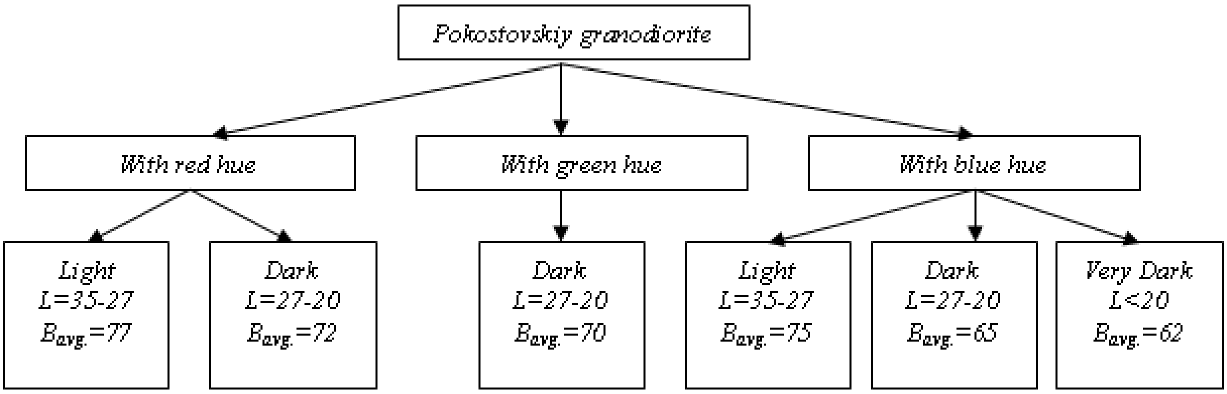

Fig. 2. Description of the main types of Pokostovskiy granodiorites at mechanical polishing, where L – lightness of stone, ed.; B_{avg} - medium gloss of stone samples, relative units.

As shown in Fig. 2, different types of Pokostovskiy granodiorites have different quality indicators. The light types of stones have the greatest value of gloss, and the dark ones – the least. Taking into account the different features of types of Pokostovskiy granodiorite, in the future, the authors plan to consider the impact of chemical impregnating agents on the quality indicators of natural stone surfaces.

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