

WayScience

The background of the entire page is a bokeh effect of warm, golden-yellow and blue light spots. In the center, a hand wearing a blue glove holds a magnifying glass. The lens of the magnifying glass is focused on a glowing, textured surface that appears to be a microscopic view of a material or a complex network of fibers, with bright yellow and orange highlights. The overall aesthetic is scientific and futuristic.

15th International Scientific
and Practical Internet Conference

«Modern Movement of Science»

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- biological sciences;
- physical and mathematical sciences;
- other professional sciences.

Dnipro, Ukraine – 2023

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**RELATIONSHIP OF PHYSICAL-MECHANICAL INDEX
COMPRESSIVE STRENGTHS WITH THE OPTIMUM COMPOSITION OF MODIFIERS
OF THE GYPSUM MIXTURE OF THE PACKAGING MATERIAL
IN THE MANUFACTURE OF REMOVABLE DENTURE STRUCTURES**

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Topicality. Successful dental rehabilitation of a patient with complete removable dentures depends not only on a number of features of the selected design and clinical conditions of the patient's prosthetic area, but also on the technology of the materials used for its manufacture.

It is common knowledge that medical plaster has a specific gravity (2.67–2.68) g/cm³. Its hardening begins after 4–15 minutes and ends after (6–30) minutes, depending on the type of gypsum mixture. Strength limit – (35–200) kg/cm². The tensile strength of a standard gypsum mixture 24 hours after hardening is (3–7) kg/cm², and after 7 days – (8.7–14.2) kg/cm²[1].

According to the classical method of obtaining a reflection of the patient's prosthetic area during the laboratory stages of the manufacture of removable orthopedic constructions (ROC) requires the use of insulating varnish, which, in turn, leads to the inaccuracy of transferring the microrelief of the prosthetic area of the plaster model to the inner surface of the base of the removable lamellar prosthesis [2].

The purpose of our study was to determine the optimal concentration of gypsum mixture modifiers in the study of the physico-mechanical index of compressive strength in patients using removable denture structures made according to the improved technique.

Prosthetic treatment of patients with complete dentition was carried out at the Department of Orthopedic Dentistry of the University Dental Center of the Kharkiv National Medical University.

We performed orthopedic treatment of 64 patients aged 55 to 80 years (average age was [62.9±1.8] years) with complete removable dentures on the upper and lower jaws. An alloyed packing material based on gypsum and super gypsum, modified with nitrile rubber latexes and organosilicon emulsion, was developed. It should be noted that special attention was paid to the study of the effect of the emulsifier on the interaction of aggregates of latex and organosilicon emulsion with the surface of modified gypsum.

Results and their discussion. All samples of gypsum compositions with the addition of modifying additives in different concentrations were tested for compressive strength. The results are presented in Table 1. Research has shown that there is a certain dependence of the compressive strength index of the gypsum mixture on a certain modifier and its concentration in the aqueous phase. An important role was played by the ratio of KE-10-01, PVA, BS-65-GP and PVA modifiers.

Table 1. Dependence of compressive strength on modifier concentration

Research stage number	Concentration of modifiers in aqueous solution, %				Compressive strength, MPa		
	KE-10-01	PVA	BS-65-GP	PVA	"Base Stone"	"GV-G-10 A-III"	"ORTHO-GYPS"
1	0.09	0.08	0.08	0.10	28.0±0.6	26.5±2.6	35.0±3.4
2	0.45	0.42	0.40	0.50	34.7±0.5	29.9±0.3	37.5±0.23
3	0.9	0.83	0.81	0.75	39.4±0.3	31.6 ±0.6	39.2±0.3
4	1.8	1.67	1.62	1.0	42.5±0.7	36.1 ±0.5	44.9±0.5
5	4.5	4.17	4.04	1.75	51.8±0.5	43.9±0.6	53.9±0.67

When studying the properties of modified samples of alloyed packaging materials, the obtained indicators were compared with the values of indicators of standard compositions of gypsum mixtures without adding modifiers.

As a result of the research, the compressive strength of gypsum samples for auxiliary doped packaging material "ORTHO-GYPS" is significantly higher at all concentrations of KE-10-01, PVA, BS-65-GP and PVA modifiers than the standard composition of industrial medical gypsum and water, numerical values which varies in the range of values from (35.0±3.4) to (53.9±0.67) MPa, which has a positive effect on the quality of the manufacture of the removable orthopedic structure of the prosthesis in the subsequent laboratory stages [3].

For gypsum mixture "Base Stone" compressive strength is also significantly higher than that of the standard composition according to ISO-6873. The maximum value of the indicator is (51.8±0.5) MPa at modifier concentrations with an average value of 4.04%.

Conclusions. By changing the concentration of modifiers, it was possible to regulate the manufacturability of the compositions in the process of forming removable structures of dental prostheses and the index of compressive strength of the modified gypsum mixture.

As a result of the study, it was possible to regulate the surface quality of gypsum samples by changing the concentration of modifiers added to the investigated gypsum mixture, which affected the physical and mechanical properties of the surface layer.

Keywords: modifier, packing material, removable dentures, gypsum, compressive strength.

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