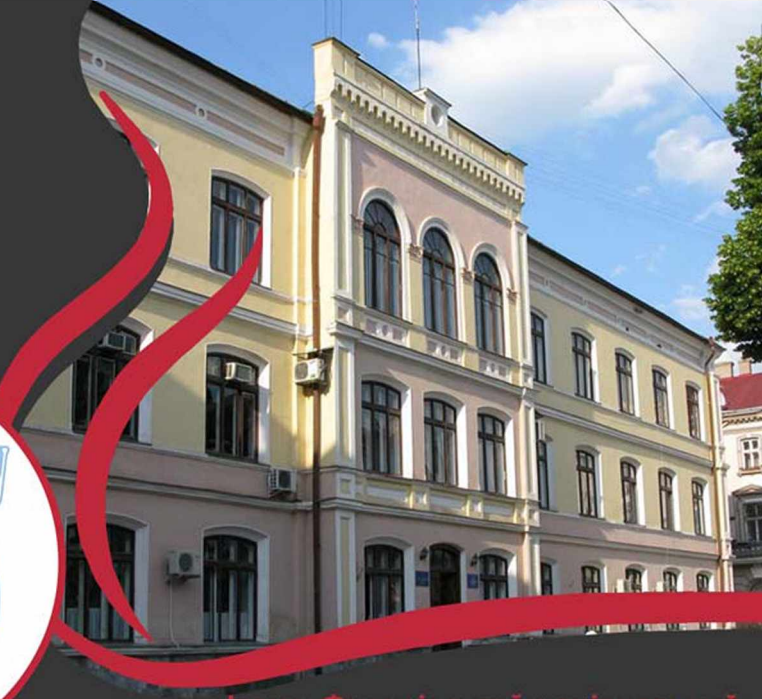


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Чумаченко О.В., Пермінов О.Б.
ВІДДАЛЕННІ РЕЗУЛЬТАТИ ЛІКУВАННЯ КІСТ ЩЕЛЕП ВЕЛИКИХ РОЗМІРІВ ЗА ВЛАСНОЮ МЕТОДИКОЮ 90

Шибінська М.В., Макєєв В.Ф.
КОМПЛЕКСНА СТРАТЕГІЯ ДІАГНОСТИКИ ПАЦІЄНТІВ ІЗ СНР: ІНТЕГРАЦІЯ ГАМБУРЗЬКОГО ПРОТОКОЛУ, ЕЛЕКТРОННОЇ АКСІОГРАФІЇ ТА БІОПСИХОСОЦІАЛЬНОЇ ОЦІНКИ ЯКОСТІ ЖИТТЯ У 2024–2026 РОКАХ 91

Yanishen I.V., Bugayev V.Y.
DETERMINATION OF HYDROPHOBIC PROPERTIES OF TYPE I A-SILICONE IMPRESSION MATERIALS 93

I.V. Yanishen, O.L. Fedotova, N.L. Khlystun
A STUDY OF THE EFFECT OF A GLASS-CERAMIC COATING ON THE METAL COMPONENTS OF REMOVABLE DENTAL PROSTHESES ON SALIVA PARAMETERS IN PATIENTS WITH ALLERGIC CONDITIONS 95

Янковецька І.М., Ожоган З.Р., Янковецька В.Е., Базилевич Т.М.
СТОМАТОЛОГІЧНИЙ СТАТУС ТА ПОТРЕБА В ОРТОПЕДИЧНІЙ ДОПОМОЗІ У МОЛОДИХ ЛЮДЕЙ, ЯКІ ПРОЖИВАЮТЬ У СІЛЬСЬКІЙ МІСЦЕВОСТІ 98

DETERMINATION OF HYDROPHOBIC PROPERTIES OF TYPE I A-SILICONE IMPRESSION MATERIALS

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Introduction. In modern prosthetic dentistry, the accuracy of impression-taking is a key factor determining the quality of prosthetic restorations [1]. One of the key characteristics of impression materials is their hydrophobicity, which affects the material's ability to interact with the moist environment of the oral cavity and accurately reproduce the tissue topography [2]. A-silicone impression materials are widely used due to their high elasticity, dimensional stability, and accuracy in detail reproduction [1, 3]. At the same time, their relative hydrophobicity can hinder the wetting of tissue surfaces in the presence of oral fluid, which sometimes leads to impression defects [4].

In this regard, determining the hydrophobicity parameters of Type I A-silicone impression materials is relevant, as it allows for the assessment of their surface properties and justifies the choice of material for clinical practice [5, 6].

Objective. To determine and compare the hydrophobicity of Type I A-silicone impression materials by measuring their contact angle.

Materials and methods. In collaboration with staff from the accredited dental materials laboratory at Stoma JSC (Kharkiv, Ukraine), the formulation of a domestically produced high-quality A-silicone impression material was improved, and a comparative evaluation was conducted with accredited counterparts. Twenty test samples (five of each material) were prepared to determine hydrophobicity according to ISO 4823. The laboratory study utilized: the improved domestic A-silicone impression material with decontamination properties "ASIMD," domestic A-silicone impression material "ASIMN" (Ukraine), as well as foreign analogues – A-silicone impression material "ASIMG" (Germany) and A-silicone impression material "ASIMI" (Italy). The hydrophobic properties of A-silicone impression material were evaluated using the contact angle measurement method. A microscopic method was used to directly measure the contact angle. Water droplets were applied to a uniformly distributed layer of A-silicone impression material. If the contact angle is less than 90°, the material is hydrophilic; if greater

than 90°, it is hydrophobic. The method involves applying a thin layer of A-silicone impression material to a glass slide. The slide is immersed in a container of liquid, and the time it takes for the liquid to rise to a certain height is measured. The study is conducted for a single slide in two different liquids: water and hexane. Measurements in hexane allow for the calculation of the capillary radius, while measurements in water allow for the numerical calculation of the contact angle with water. For the indirect measurement of the contact angle, the following formula was used:

$$\cos\Theta = 2\eta * h2 / r * \sigma * t,$$

where h is the capillary rise height, mm; t is the rise time, s; r is the capillary radius, mm; $\cos\Theta$ is the cosine of the wetting angle; η is the dynamic viscosity of the wetting liquid, Pa·s; σ is the surface tension of the liquid wetting the powder, N/m. All data obtained from the physical and mechanical studies are presented in the International System of Units (SI). The results were entered into a computer database using specialized software running on the Microsoft Excel 2021 platform.

Results. The lowest hydrophobicity value was observed in the "ASIMI" material, which was (93.6±0.2)°. For the "ASIMN" material, this value was 4.7° higher than that of "ASIMI." For the "ASIMN" material, the contact angle was 9.5° higher than that of "ASIMI" and 4.8° higher than that of "ASIMN." The value for the "ASIMD" material was 22.8° higher than that of "ASIMI," 18.1° higher than that of "ASIMD," and 13.3° higher than that of "ASIMN." The differences observed between the materials are statistically significant ($p<0.05$).

Conclusions. All of the A-silicone impression materials studied meet the requirements of the ISO standard regarding hydrophobicity. The material "ASIMI" has the smallest contact wetting angle and, accordingly, the lowest hydrophobicity, whereas the most pronounced hydrophobic properties are characteristic of the material "ASIMD," which is statistically significant ($p < 0.05$).