

**REPORT**

**From Assoc. Prof. Dr. Todor Tsonkov Uzunov, PhD**

МЕДИЦИНСКИ УНИВЕРСИТЕТ  
ПЛОВДИВ  
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**Medical University - Sofia**

**Sofia 1431, 1, "Sv. G. Sofiiski" blv.**

of a dissertation for awarding the educational and scientific degree "**Doctor**"

Professional direction 03.03.03

Doctoral program "*Prosthetic dentistry*"

**Author:** *Dr. Elena Kostadinova Vasileva*

**Form of dissertation:** *self-preparation*

**Department:** *„Prosthetic dental medicine“*

**Topic:** *„Comparison of two types of press ceramics with different composition of the crystalline phase“*

**Scientific Supervisor:** *Prof. Angelina Vlahova, DMD, PhD*

*Department „Prosthetic dental medicine“, FDM, MU-Plovdiv*

### **1. General presentation**

The structure of the dissertation submitted for report meets the requirements of LADASRB and the Regulations for its application in the Regulations of MU-Plovdiv from 06.11.2014, and contains the subheadings: introduction, literature review, analysis of literature review, purpose and tasks, own research - material and methods, results and discussion of the results, conclusions, contributions, bibliography and application. The author's publications in connection with the dissertation and the contributions of the dissertation are given in the author's abstract.

The dissertation presented for a statement is written on 230 numbered standard typewritten pages and 5 unnumbered pages. The dissertation includes: 3 pages of content, 1 page of used abbreviations, 2 pages of introduction, 57 pages of literature review, 1 page of aim and tasks, 112 pages of own research, 36 pages of bibliography, which contains 291 literature sources, of which 33 are in Cyrillic and 258 in Latin, 17 pages of appendices. It is illustrated with 10 tables, 18 diagrams and 68 figures.

The PhD student has submitted 4 publications in scientific journals, 3 participations with scientific reports at scientific congresses and 1 successfully completed research project on "Comparative

assessment of the polish ability of press ceramics systems with lithium disilicate and lithium silicate crystalline phase"

## **2. Relevance of the topic**

The relevance of the developed problem in scientific and scientific-applied terms is underlined in the introduction of the dissertation, indicating the place and importance of highly aesthetic ceramic materials, which have exceptional advantages: incomparable optical and aesthetic properties, along with high biocompatibility, high mechanical resistance, reduced thickness and highly wear behavior. The critical comparative analysis of classical and modern ceramic materials for non-removable restorations as veneering or reinforcing material has a high degree of relevance in scientific and applied terms.

## **3. Knowledge of the problem**

The literature review clarifies the problem of the evolution and use of different types of ceramic materials for the purposes of dental treatment and creatively presents the most significant contributions in historical terms at home and abroad. The main productions of Bulgarian and foreign authors for classification of the types of ceramic materials are described. Their advantages and disadvantages are commented. The existing methods for the production of all-ceramic prosthetic restorations are presented in detail. Particular attention is paid to the mechanical, optical and surface characteristics of lithium disilicate and lithium silicate press ceramics. The advantages and current limitations for their use are considered on the basis of the results of the researched articles. The optical characteristics of the natural tooth structures and the methods for their examination and evaluation are considered. Finally, a precise analysis of the literature review is performed and the fully clarified, partially resolved, controversial and unresolved scientific issues are formulated, which logically lead to the choice of the aim of the dissertation.

## **4. Material and methods of investigation**

The aim and the set tasks are very well formulated, correspond to the title and the content of the dissertation.

The material on which the research was conducted is sufficient to derive statistically reliable scientific results: under the first task, 106 dentists were examined; on the second task - studies were performed on 40 experimental samples, extruded from lithium disilicate press ceramics IPS E.max Press produced by Ivoclar Vivadent and from lithium silicate press ceramics Celtra Press produced by Dentsply Sirona; under the third task, two groups of experimental bodies were made, the first - of lithium disilicate, and the second - of lithium silicate press ceramics with the same color (A2) and translucency (HT) to study the processes of absorption, light reflection and refractive index; under the fourth task, 20 experimental bodies were made, divided into six groups depending on the way of

processing both sides of each experimental body; in the fifth task the same prototypes were used with a rectangular shape and size 1.6 cm by 0.8 cm and a thickness of 0.2 cm from two types of press ceramics from task 4.

The chosen research methods allow to achieve the set aim and to obtain an adequate and objective answer to the tasks solved in the dissertation.

A survey method was used for the first task. The survey was completed by 106 dentists. The survey was distributed in paper form during national forums of the Bulgarian Dental Association, congresses and forums of the Bulgarian Academy of Aesthetic Dentistry.

The second task evaluates the degree of filling of a complex geometric figure in the investment material, corresponding to a factory reticulated wax plate with a thickness of 5 mm, in which are located round holes with a diameter of 2 mm, after the process of pressing ceramics.

The third task for spectral analysis of the experimental models uses a fiber optic spectrometer developed on the basis of the Ocean Optics QE 65000 spectrometer. A Lambda 25 spectrophotometer was used to measure the light absorption of the test materials. An M-2000® Spectroscopic Ellipsometer was used to determine the light refractive index of the two types of press ceramics.

A portable Profilometer - Sutronic 3+ was used for the fourth task to measure the roughness parameters.

On the fifth task, the surface of the test specimens was observed before and after their treatment with two types of diamond burs with different size of the crystals and a set of clinical polishing rubbers, with and without diamond paste, with a scanning electron microscope (SEM). An atomic force microscope (AFM) was used to evaluate and compare the roughness parameters.

The selected and tested material, as well as the applied methods, are a premise for obtaining reliable results.

## **5. Characteristics and evaluation of the dissertation and contributions**

The results obtained in all five tasks are reliable, correctly statistically processed and comprehensively presented in the dissertation.

In the discussion of the results, a comparative analysis was conducted with similar scientific studies of other authors, highlighting the reasons for the difference or coincidence of the established data. The results are emphasized, which are the contribution of the PhD student and are important in scientific and applied terms.

The conclusions are well formulated and they emphasize the importance of the dissertation:

1. There is a significant information deficit regarding the indications and contraindications of various ceramic materials. The application of all-ceramic crowns, bridges and veneers and poorly represented in prosthetic treatment in Bulgaria. The correction of an already cemented ceramic restoration is a challenge for any dentist. Those who dare to take this step make the correction most often by finishing and polishing.



2. The complete pressing of a given structure is determined by the crystal size of the used press ceramics. The reproduction accuracy of the structure is higher with a smaller crystal size. The lithium silicate press ceramics is characterized by better compressibility, which is determined by the smaller size of the crystals in its structure.

3. LSC and LDSC have similar values of light refraction indices. Values for the reflection coefficient and the degree of light absorption are lower in LSC. The reflection spectra of LSC and LDSC in the range of 200-1000 nm when illuminated with a xenon lamp almost completely overlap, which shows that the two types of ceramic materials reflect almost equally the incident light.

10. In the range of 540-620 nm, both ceramics have practically the same reflectivity of the standard material and in this range of illumination would not give indications of a difference in color perception with respect to the material with which we compare them. The optical properties of ceramic materials depend on their particle size.

4. The imposition of a correction of a ceramic restoration made of press ceramics in clinical conditions leads to a qualitative change of the surface relief and the quantitative indicators of roughness created in the dental laboratory. The large number of variables that affect the final result must be taken into account when polishing. Standardization of the methodology is needed. The use of diamond polishing paste, after correction in clinical conditions of press ceramic restoration, makes the ceramic surface smoother compared to polishing without paste. In order to obtain a perfectly smooth surface, it is recommended that all adjustments to the ceramic restorations be made before their cementation, so that they can be sent for adjustment to the dental laboratory before their final cementation.

## **6. Assessment of the PhD student's publications and personal contribution**

The developed dissertation is a personal work of the PhD student. The obtained results and the formulated contributions are a personal work of the author. Contributions that are a novelty of national importance are:

1. For the first time in Bulgaria was conducted a survey among the dentists about the different types of ceramic materials and their use, establishing a deficit of knowledge related to the indications and their application.
2. For the first time in our country is created a method for determining the compressibility of glass-ceramics processed by pressing.
3. For the first time in our country the properties of two types of press ceramics with different composition of the crystal phase are compared.
4. For the first time in our country was made a study of some of the properties (optical, mechanical) of press ceramics with crystalline phase of lithium silicate, reinforced with 10% zirconium dioxide.

5. The claim that the polishing of the ceramic surface after correction cannot achieve the smoothness of the glazing is confirmed.
6. It has been proved that the particle size in the composition of the ceramic material has an effect on its properties.
7. It has been proven that LDSC and LSC have excellent optical properties to recreate aesthetics.

The four publications that are related to the PhD thesis represent the most important parts of the dissertation. The successfully completed research project reflects the essence of the research.

Critical remarks and recommendations. Recommendation for extending the scope of research to similar ceramic materials provided for CAD-CAM technology for the production of prosthetic restorations.

### **7. Author's abstract**

The content and quality of the author's abstract are in accordance with the accepted requirements. The abstract summarizes the main results achieved in the dissertation

### **CONCLUSION**

The dissertation contains *scientific, scientific-applied and practical results, which represent an original contribution to science* and **respond to all the requirements** of the Law Act for development of the academic staff in the Republic of Bulgaria (LADASRB). The presented materials and dissertation results **fully** comply with the specific requirements received in connection with the Regulations of MU - Plovdiv for applying of LADASRB.

The dissertation shows that the PhD student Dr. Elena Kostadinova Vasileva **has** exhaustive theoretical knowledge and professional skills in the scientific specialty "Prosthetic Dentistry" and **demonstrating** qualities and abilities for self-conduct scientific study.

Due to the above, I confidently give my *positive assessment* for the research presented by the above reviewed Dissertation, Abstract, Results and Contributions, and *I propose to the honorable scientific jury to award an educational and scientific degree "Philosophy Doctor (PhD)"* to Dr. Elena Kostadinova Vasileva in a PhD program of Prosthetic Dentistry.



**Reviewer:** Assoc. Prof. Dr. Todor Uzunov, PhD