Appendix 12d

REPORT
to occupy the academic position:

''Professor''	
''Associate Professor''	X
	one of the academic positions indicated shall be marked with the sign "X"

Candidates to occupy the position:

1	Assist.prof.	PhD	Tina	Radmilova	Tasheva	UCTM
№	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

5	Technical sciences
code	name

Professional area:

5.6	Materials and Materials Science
code	name

Scientific specialty:

Silicate Materials

The competition has been announced:

64	05.08.2025	Silicate Technology	Metallurgy and Materials Science
in SG issue	date	for the needs of the Department	Faculty

The report was written by:

Assoc. prof.	PhD	Stancho	Ivanov	Yordanov	IMSETHAC "Acad.A. Balevski"
academic position	scientific degree	name	middle name	last name	workplace

1. Report for the candidate:

Assist. Prof.	PhD	Tina	Radmilova	Tasheva	UCTM

academic position	scientific degree	name	middle name	last name	workplace

1.1. Meeting the minimum requirements under the Regulations:

A) The candidate meets the minimum requirements	20 points	X
B) The candidate doesn't meet the minimum requirements	0 points	
		one of the answers given is marked with the sign "X"

It must be filled in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.
According to the report on the performance of the points on the indicators for holding the academic position of Associate Professor in Professional Direction 5.6 Materials and Materials Science at the Technical University of Sofia, in all groups of indicators, Assist. Prof. Tasheva exceeds the minimum required points. On indicator 4 - Habilitation work, in the form of scientific publications that are referenced and indexed in world-renowned databases with scientific information, the candidate presents 162.24 points out of the required 100 points. The articles assigned to the Habilitation report are 10, published in specialized journals for glasses with a high impact factor (over 2.5). Asst. Prof. Tasheva presents 8 other original scientific research articles related to indicator 7 - Scientific publications in journals that are referenced and indexed in world-renowned databases with scientific information. According to this indicator, the candidate presents 208 points out of the required 200 points. Thus, in the competition for associate professor Tina Tasheva participates with 18 scientific publications that are on the topic of the current competition. The presented publications do not repeat those for acquiring the educational and scientific degree "doctor." In most publications, she is the first author The citations on the articles with which she participated in the competition are 17, which according to the Regulations carry 170 points, with 50 points required, which is indicative of the quality of the scientific publications. Although according to the regulations for holding the academic position of "associate professor" participation in projects is not required, the candidate presents a considerable list of participations. She was the head of 2 projects in the Competition for Funding of Fundamental Research for Young Scientists and Postdoctoral Fellows at the Scientific Research Fund and the head of 2 projects at the National Program Young Scientists and Postdoctoral Fellows at the Ministry of Education and Science. She is a participant in 2 projects at the National Science Foundation and projects funded under the Operational Program "Science and Education for Smart Growth", as well as in a project under the National Recovery and Sustainability Plan. Participant in projects at NIS – HTMU. She has published a textbook - "Guide to Exercises in Structural Analysis". Thus, the total number of points in Indicator E is 171. The total number of points that the assist. Prof. presents is 761.24, with the required number of points for holding the position of associate professor - 400.

1.2. Relevance of scientific and / or applied research:

A) The research is relevant. Part of the research is pioneering (no results are known on the topic by other authors)	8 points	
B) Research is relevant. Results from other authors are known for each of the topics and / or applications studied.	6 points	X
C) Most of the research is relevant, but also some results are presented that have no scientific and / or applied value	4 points	
D) The smaller part of the research is relevant	2 points	
E) Research is not relevant	0 points	
		one of the answers given is marked with the sign "X"

The evaluation of the relevance of the research must be substantiated.
The refractive index, nonlinear optical characteristics, and optical basicity allow for a more in-depth study of the structure and behavior of the material when interacting with light and are the basis for applications in nonlinear optics; the electronic oxygen polarizability describes the electronic structure and is the basis for modeling the optical properties; This is why studying the optical characteristics of synthesized glasses is relevant and of high scientific value. Bioglasses are one of the most current and rapidly developing areas in modern materials science and biomedicine. They serve as skeletal materials for the growth of new cells; They are used for bone and soft tissue regeneration, dental implants, titanium implant coatings, etc.

1.3. Objectives of the research:

A) Realistic and of scientific and / or applied interest	8 points	X
B) Realistic, but not of scientific and / or applied interest	4 points	
C) Unattainable (unrealistic)	0 points	
		one of the answers given

		is marked with the sign "X"

Objectives must be specified. The type of the set objectives must be justified
The fundamental research conducted by Asst. Prof. Tasheva has an applied focus and can be summarized as follows: 1. Study of new oxide glass compositions, as well as preparation of glass-ceramics based on them, in order to create materials with potential application in optics and biomedicine. 2. Structural characterization of the synthesized glasses; 3. Study of the optical characteristics and bioactive properties of the materials as key parameters determining their applicability. 4. Establishing the relationship between the composition, structure and properties of the studied materials.

1.4. Candidate research contributions:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	X
C) They are of scientific and / or applied interest	12 points	
D) Lack of significant contributions	8 points	
E) Lack of contributions	0 points	
		one of the answers given is marked with the sign "X"

Contributions must be specified. The type of results achieved must be justified.

The research activity of Assist. Prof. Dr. Tina Tasheva includes:

1. Synthesis of oxide glasses with the participation of traditional and non-traditional glass formers; development of structural models describing the network of glasses; determination of optical characteristics of glasses; establishment of the composition-structure-property relationship;

2. Preparation and structural characterization of new glasses, glass-ceramics and ceramics for application in dental and regenerative medicine.

New theoretical data and experimental results have been obtained on the electronic polarizability and optical basicity of simple oxides (SiO_2, Al_2O_3, TiO_2) and oxide glasses with the participation of Bi_2O_3, Nb_2O_5, GeO_2, B_2O_3, TeO_2.

The optical basicity, $\Lambda(n_0)$ and the interionic interaction parameter, $A(n_0)$, have been calculated using the Lorentz–Lorentz formula and the Yamashita-Kurosawa theory. A strong dependence of these parameters on the amount of Bi_2O_3 has been established. Comparison with other glasses shows that Bi_2O_3-based glasses have extremely high optical basicity ($\Lambda(n_0) \sim 1.15$) and very weak chemical bonding ($A(n_0) \sim 0.01$ Å-3). The obtained results contribute to the clarification of the mechanisms determining the optical and electronic properties of oxide glasses. This knowledge provides a basis for the targeted development of new materials with desirable and controllable characteristics.

The optical basicity, $\Lambda(n_0)$, of binary and ternary silicate glasses has been determined based on the refractive index. New values of the optical basicity for individual oxides have been proposed, which allow for the quantitative determination of the dependence of the optical basicity on the composition and structural units making up the glass network.

The structural role of Nb_2O_5 in multicomponent oxide glasses has been studied, which acts as a glass-forming oxide by stabilizing the glass network. Nano-sized heterogeneous regions rich in Nb_2O_5 have been identified, stimulating the nucleation and growth of functional nanocrystals. The results obtained are the basis for the preparation of new functional oxide glasses and glass-ceramics containing Nb_2O_5 with desired optical properties.

The relationship between the structure and optical basicity of tellurite glasses in the TeO_2-V_2O_5-MoO_3 system has been established. By applying the polarization approach, the electronic polarizability, optical basicity and theoretical refractive index of the glasses have been determined. It has been established that the addition of V_2O_5 leads to an increase in the free volume and the number of non-bridging oxygens, while the introduction of MoO_3 causes better crosslinking of the glass network. The main structural units building the glass network have been determined by IR spectroscopy. The existence of weak, ionic bonds with high polarizability has been proven.

Multicomponent silicate glasses in the systems Na_2O-CaO-SiO_2-Fe_2O_3 and Na_2O-BaO-ZrO_2-TiO_2-SiO_2-B_2O_3-Al_2O_3 were obtained and the influence of modifiers on the properties of the glasses was studied. Fe_2O_3 leads to an increase in density, molar volume and refractive index, as well as changes in oxygen density. It causes depolymerization and

loosening of the amorphous network. In the presence of ZrO_2 in silicate glasses, the hardness, elastic modulus and crystallization temperature increase, which is due to the formation of a stronger and more stable three-dimensional structure. The results obtained show that the controlled introduction of various modifiers can lead to the regulation of the properties of the glasses..

Bioactive silicate glass compositions were synthesized in order to study the possibilities of applying a glaze layer on dental zirconia ceramics (Y-TZP).

A composition with the highest content of alkali oxides was found, which is characterized by a coefficient of thermal expansion close to that of zirconia ceramics. The applied layer is distinguished by high transparency and good fluidity, which makes it a suitable material for dental applications. New bioactive glassy, glass-ceramic and ceramic materials based on biogenic hydroxyapatite (BHA), synthesized from Rapana venosa shells, were also obtained. Dense ceramic samples containing 25 wt.% glass (B_2O_3-SiO_2-Al_2O_3-Na_2O), hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$), and a new bioactive crystalline phase $Na_3Ca_6(PO_4)_5$ were sintered. Tests conducted in simulated body fluid (SBF) prove the material's ability to form an apatite layer, with good adhesion, compatibility and bioactivity, which is the basis of its bioactive potential.

Apart from the habilitation thesis, other scientific contributions related to

Structural characterization of borate oxide glasses with application in medicine

Depending on the composition and properties, borate glasses can also be bioactive glasses and their study is of interest to scientists. That is why the candidate in the competition studied the structural features of borate glasses from the B_2O_3-Na_2O-CaO-P_2O_5 system and the influence of synthesis conditions on the type of the obtained samples – amorphous, crystalline or glassy. Some physicochemical parameters were determined: density in the range 2.538 – 2.623 g/cm³, molar volume between 26.566 – 27.420 cm³/mol and oxygen density in the range 73.669 – 76.262 mol/cm³. A close relationship between the composition and structure of the studied glasses was established, with the addition of ZnO and MgO leading to structural modification and partial depolymerization of the borate network.

Studying the influence of structure on the optical and dielectric characteristics of multicomponent oxide glasses

Applying the polarization approach, the relationship between the composition, structure and optical properties of borate glasses in the $BaO–TeO_2–Bi_2O_3–B_2O_3$ system has been analyzed. The amorphous networks have been characterized by the interionic interaction parameter, oxygen density and single bond strength.

The experimentally determined refractive indices are in good agreement with the theoretical values determined by the polarization approach, which allows for the development of new functional materials for optical applications.

Tellurite glasses in the V_2O_5-BaO-TeO_2 system have been synthesized. The glasses possess high values of electronic polarizability as well as optical basicity, high values of refractive index (n_0) and significant third-order nonlinear optical susceptibility $\chi(3)$.

It has been found that V_2O_5 causes structural transformations in the amorphous network, which affects the optical characteristics of the glasses.

The dielectric permittivity, dielectric loss and frequency-dependent conductivity (100 Hz - 1 MHz at room temperature) of vanadate glasses containing TeO_2 and BaO have been measured. The replacement of BaO with TeO_2 leads to important structural changes

in the amorphous vanadate network, which affect the dielectric properties. As a result of the conducted research, the important conclusion was made that the formation of Te-O-V bonds, when replacing BaO with TeO_2, reduces dielectric losses. The obtained results reveal opportunities for the development of new functional materials with potential application in various fields.

Another class of studied glasses are borate and bismuthate glasses in the system: Na_2O-Bi_2O_3-B_2O_3.

High values of nonlinear optical susceptibility $\chi(3)$, ($0.90 – 2.42\times10^{-13}$ esu), were obtained, which makes the glasses potential candidates for application in nonlinear optics. The network of glasses with a high content of Bi_2O_3 is built up of weak chemical bonds. They are characterized by low values of the interionic interaction parameter (0.224 – 0.051 $Å^{-3}$) and of the chemical bond strength (377 – 198 kJ/mol). The observed optical properties are explained by the structural features of the glasses – networks with a low content of Bi_2O_3 are built up of pyro- and orthoborate units, while networks with a high content of Bi_2O_3 contain mainly orthoborate groups.

A common trend has been established for borate, silicate, germanate, tellurite and glasses containing heavy metal oxides: the increase in optical basicity is accompanied by a decrease in the strength of the single chemical bond, which is due to an increase in the polarizability of the oxide ions.

Characterization of products from carbonization of cement kiln dust

As a member of a scientific team in a project at the Scientific Research Fund of the Institute of Mineralogy and Crystallography at the Bulgarian Academy of Sciences, T. Tasheva's main activity was related to the structural characterization of materials.

Two approaches were applied to characterize the products obtained from carbonization of cement kiln dust: direct carbonization of dry powder and carbonization of hydrated powder. After carbonization, calcite formation was proven.

1.5. Participation of the candidate in the achievement of the presented results:

A) The candidate has at least an equal participation in the submitted papers	8 points	X
B) The candidate has at least an equal participation in most of the submitted papers	7 points	
C) The candidate has a secondary participation in most of the submitted papers	4 points	
D) The candidate participation is unnoticeable	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the items C or D is marked.

1.6 Pedagogical activity:

A) The candidate has effective and sufficient pedagogical activity at the university. The textbooks issued are modern and useful (they meet the requirements of the Regulations). The work with undergraduate and doctoral students is at a high professional level.	8 points	X
B) The candidate has sufficient pedagogical activity at the university. The textbooks issued satisfy the requirements of the Regulations.	6 points	
C) The pedagogical activity and / or textbooks issued are insufficient (do not meet the requirements of the Regulations)	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the items B or C is marked.

1.7. Critical notes:

A) Lack of critical notes	8 points	X
B) Critical notes of a technical nature	7 points	
C) Critical notes that would partially improve the results achieved in a small part of the research	5 points	
D) Critical notes that would partially improve the results achieved in most of the research	3 points	
E) Significant critical notes	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the answers C, D or E is marked.

1.8. Conclusion

A) The evaluation of the candidate's activity is **POSITIVE**	This evaluation is assigned to a total number of at least 50 points	X
B) The evaluation of the candidate's activity is **NEGATIVE**	This evaluation is assigned to a total number below 50 points	
		one of the answers given is marked with the sign "X"

To be filled in if requested by the member of the scientific jury
The documents and materials presented by Assist. Prof. Dr. Tina Radmilova Tasheva meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the relevant Regulations of the UCTM. A sufficient number of scientific papers published after obtaining the educational and scientific degree "Doctor" are presented. The results achieved from the research activities of Assistant Professor Dr. Tina Tasheva reveal her as a young researcher with a clearly established scientific profile in the field of oxide glasses, their structural characterization and study of their optical properties.. My assessment of the scientific research and pedagogical activity of Assist. Prof. Dr. Tina Radmilova Tasheva is positive and I strongly recommend that the members of the Scientific Jury award Assist. Prof. Dr. Tina Radmilova Tasheva the academic position of "Associate Professor" in Professional Field 5.6 Materials and Materials Science.

	The report was written by:	
date	Assoc. prof. Stancho Yordanova	signature