

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	assistant professor	PhD	Ani	Angelova	Stoilova	1.UCTM-Sofia 2. IOMT - BAS
Nº	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

4.0	Natural Sciences, mathematics and informatics
code	name

Professional area:

4.1	Physical Science
code	name

Scientific specialty:

Electrical, magnetic and optical properties of condensed matter

The competition has been announced:

issue 14	Feb 18 th 2022	Physics	
in SG issue	date	for the needs of the Department	Faculty

The report was written by:

Professor	PhD	Tsvetanka	Krumova	Babeva	Institute of Optical Materials and Technologies – Bulgarian Academy of Sciences
academic position	scientific degree	name	middle name	last name	workplace

1. Report for the candidate:

assistant professor	PhD	Ani	Angelova	Stoilova
academic position	scientific degree	name	middle name	last name

1.1. Meeting the minimum requirements under the Regulations:

A) The candidate meets the minimum requirements	20 points	X
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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.

The applicant meets the minimum national requirements as well as those set by the UCTM. The gained number of points by groups of indicators is as follows:

group A - 50 points (of at least 50 pts)
group B - 123 points (of at least 100 pts)
group G - 201 points (of at least 200 pts)
group D - 78 points (of at least 50 pts)

Dr. Stoilova participates in the competition with 21 scientific publications. For group B she presented the equivalent of habilitation work, containing 10 articles (this is the minimum number of articles required in this group according to the Rules of UCTM), distributed into quartiles as follows: 3 papers in Q3 journals, 4 papers in Q4 and 3 papers in journals with SJR that do not fall into any of the 4 quartiles. For group G she presented 11 papers, categorized as follows: Q1 – 3 papers, Q2 – 3 papers, Q3 – 2 papers and Q4 – 3 papers. The high level journals in which the papers were published make a very good impression. I will mention some of them: *Spectrochimica Acta Part A* (IF 4.10), *Journal of Photochemistry and Photobiology A: Chemistry* (IF 3.98), *Optical materials* (IF 2.78).

In the competition, Dr. Stoilova participated with 39 citations. According to a reference in the Scopus database from June 8th 2022, the works of Dr. Stoilova have been cited more than 40 times. The most cited work that has 18 citations is №4 from Table Appendix 6a. There is a constant trend of increasing the number of citations for the last 5 years. I have no doubt that this positive trend will continue.

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.

Most of the research in the papers presented in the competition is in the field of materials science and in particular is related to the development of media for polarization recording. The research in these works is focused on thin-film media of azopolymer PAZO (*poly [1- [4- (3-carboxy-4-hydroxyphenylazo) benzenesulfonamido] -1,2-ethanediyl, sodium salt]*) doped with chalcogenide particles or particles of synthesized metal (Cu and Ni) complexes, azo dyes and composite layers based on them, crosslinked in a polymer matrix, etc. Azopolymers are very interesting materials. They are studied in the viewpoint of their application in various modern fields, such as holographic recording media and recording of polarization optical

elements and diffraction gratings. I would like to point out that polarizing holographic gratings are a promising component for biosensors, for example, because they offer a larger active surface area compared to surfaces without a grating. On the other hand, the developed materials can be used in optical switches, and a real advantage would be the development of polarization-sensitive media in the visible range.

Another part of the applicant's research is devoted to the synthesis and characterization of thin layers of chalcogenide glasses, which are used both for holographic recording and as transparent media in the IR range.

Very interesting are several works related to the use of polarized light and analysis of the change of its parameters during the light interaction with histological tissue of the lungs and liver with pathomorphological findings due to various diseases.

In general, it can be concluded that the research conducted is relevant to modern society. The obtained results have positive contribution in the mentioned areas.

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 objectives of the research can be summarized as:

- ✚ Development and characterization of polarization sensitive materials and optimization of their structure and properties aiming at enabling recording of polarization diffraction gratings and elements.

- ✚ Development and application of polarization methods for visualization of changes in biological tissues.

- ✚ Synthesis of chalcogenide glasses from the Ge-Se, Ge-Se-M (M = In, Ga, B) and Ge-Te-Cu systems, deposition of thin films from them and study of structure / properties relationship.

The objectives are realistic and of both scientific and applied interest. The objectives have been achieved through application of adequate and modern research methods. Evidence of this is the scientific papers published in referred journals with IF and the independent citations received, confirming the interest in research.

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

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

The results obtained by the applicant exhibit scientific and applied scientific nature. In general, I characterize the contributions as "*enriching existing knowledge by obtaining and proving new facts.*" I classify the obtained results and contributions in three main directions:

1. Development and optimization of polarization sensitive materials for polarization recording media:

✚ It has been deposited composite layers based on commercially available azopolymer PAZO doped with i) particles of metal (copper and nickel) complexes and ii) particles of the chalcogenide glasses from the system $(\text{GeTe}_4)_{100-x}\text{Cu}_x$, ($x = 5, 10, 15$ and 20 mol%); layers of three new perylene diimide azo dyes and composite layers based on them, cross-linked in a polyimide matrix; composite layers based on two new 2-hydroxy Schiff bases of 4-substituted phthalimide cross-linked in PMMA matrix. Time-stable polarization holographic gratings are recorded. Their diffraction efficiency was studied and the influence of the composition and concentration of the particles on the parameters of the recorded polarization holographic gratings was studied (publ. **1-6a, 3-6a, 9-6a, 5-6g, 10-6g**).

✚ Composite thin-film materials based on 4-aminazobenzen and three azo-azomethine dyes were obtained and the relationship between the structure of the dyes and the values of photoinduced birefringence was found. It has been found that dyes containing only an azo group have higher recording stability over time than layers based on azo-azomethine dyes (pub. **4-6a**).

✚ Three new N-phthalimide azo-azomethine dyes have been synthesized and their photochromic behavior in solvents of different polarity has been studied experimentally and theoretically. Laser-induced trans-cis-trans photoisomerization was performed and the dye exhibiting the highest degree of isomerization was selected (publ. **2-6a**).

✚ Azopolymers with different weight ratios of the two monomers were synthesized, which differ in the length of the side chain connecting the azochromophore to the main polymer chain. The photoinduced birefringence was optimized (publ. **8-6g**).

2. Optimization of polarization methods for visualization of changes in biological tissues

✚ The change of the parameters of light polarization during its propagation in histological samples of liver and lung of healthy patients and patients with different diagnoses was studied. The results show the possibility of using the azimuth and power of the EM wave as an optical marker to discriminate healthy from unhealthy tissue, as well as to recognize the origin of pathomorphological changes (publ. **8-6a, 10-6a**).

3. Synthesis of chalcogenide glasses and study of the structure / properties relationship

✚ Chalcogenide bulk samples from the system $(\text{Ge}_{20}\text{Se}_{80})_{85}\text{M}_{15}$ ($\text{M} = \text{B}, \text{In}$) were synthesized and their structure was studied by X-ray and neutron diffraction. A comparison was made between the experimental results and computer simulations, and a model for the atomic structure of the newly synthesized materials was proposed (publ. **5-6a**).

✚ Thin layers of Ge-Se and Ge-Se-M ($\text{M} = \text{Ga}, \text{In}$) were deposited by vacuum thermal evaporation and the recording kinetics was studied. A significant increase in diffraction efficiency with the addition of gallium or indium to the Ge-Se system was observed (publ. **1-6g**).

✚ Bulk samples of $(\text{GeSe}_5)_{100-x}\text{In}_x$ and $(\text{GeTe}_5)_{100-x}\text{In}_x$, $x=0$ and 5 mol.% were synthesized and some of their physico-chemical properties were determined. It was found that the tellurium-containing sample has a higher density than that containing selenium, and the addition of indium leads to a decrease in the density in the first and an increase in the density in the second case (publ. **7-6g**).

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	
B) The candidate has at least an equal participation in most of the submitted papers	7 points	X
C) The candidate has a secondary participation in most of the submitted	4 points	

papers		
D) The candidate participation is unnoticeable	0 points	
		one of the answers given is marked with the sign "X"

In 15 of the 21 publications presented in the competition, Dr. Stoilova is in the first (8 publications) or second (7 publications) place in the author's team, which is proof of her equal participation in most of the submitted papers.

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	
B) Critical notes of a technical nature	7 points	X
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.

I have no critical notes on the quality and quantity of the presented materials. My amendment is related to the preparation of the original scientific contributions. I would recommend the applicant to emphasize her personal contribution.

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 materials presented in the competition confirmed my personal impression that Dr. Ani Stoilova is an active, motivated and qualified young scientist who has achieved good scientific results. In addition, she has a sufficient teaching activity and she is a co-author of a textbook. No plagiarism has been found in her works, nor is there any suspicion of such. I give my positive assessment and recommend to the members of the Faculty Council to select Dr. Ani Stoilova for the academic position "Associate Professor" in the professional field 4.1 Physical Sciences.

	The report was written by:	
June 14 th 2022	Prof. Dr. Tsvetanka Babeva	signature