

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	Dimka	Ivanova	Ivanova	UCTM – Sofia
№	academic position	scientific degree	name	middle name	last name	workplace
2						
№	academic position	scientific degree	name	middle name	last name	workplace
3						
№	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

5	Technical Sciences
code	name

Professional area:

5.10	Chemical Technologies
code	name

Scientific specialty:

Chemical Resistance of Materials and Corrosion Protection

The competition has been announced:

61	02.08.2019	Inorganic and Electrochemical Productions	Faculty of Chemical Technologies
in SG issue	date	for the needs of the Department	Faculty

The report was written by:

Assoc. Prof.	PhD	Alexander	Stefanov	Zahariev	Technical University - Sofia
academic position	scientific degree	name	middle name	last name	workplace

1. Report for the candidate:

Assist. Prof.	PhD	Dimka	Ivanova	Ivanova
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
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 minimum requirements for participation in the competition, the applicant has submitted a total of 25 publications. They are distributed as follows: 10 publications on indicator 4, 8 of them have been published in impact factor journals, 9 publications on indicator 7, 4 of them have been published in impact factor journals, and 6 publications on indicator 8, part of which have been reported at prestigious international

forums. The candidate's results citation report contains a total of 42 citations of 10 publications, 32 of them originating by foreign authors. It is noteworthy that most of these citations are in international journals.

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	×
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 research published by Dr. Ivanova represents a considerable amount of research work on a number of contemporary scientific and applied, as well as applied problems, and the significant number of citations confirms the relevance of the published research. The main directions of the research are focused on certain modern scientific and applied tendencies. Among these, the synthesis and determination of important properties of intermetallic Co-Sn, Ni-Sn and Co-Ni nanoparticles, and nanocomposites with carbon, based on the mentioned nanoparticles are especially outlined. Investigations of this type are one of the priority areas in modern science and practice. Publications with the participation of the candidate on this subject, as evident from the number of citations, have received a serious response in the specialized literature. Last but not least, mention should be made of the formation of functional coatings of a new type, which may include the development of new preparations for modified crystalline and amorphous phosphate coatings of metals and alloys, hybrid nanostructured sol-gel coatings on steel, electrochemical synthesis of mixed oxides of zirconium, cerium and yttrium, and investigation of their application as cathode coatings in the electrochemical synthesis of NaClO. Moreover, as part of the candidate's studies, the synthesis of Mg-modified spinel based on MnO_2 with a composition $\text{LiMg}_{0.05}\text{Mn}_{1.95}\text{O}_4$ is also studied, as well as alloyed lithium cobaltates $\text{LiCo}_{1-y}\text{M}_y\text{O}_2$ ($\text{M} = \text{Mn, Ni}$, $y = 0.1, 0.3, 0.5$) as potential cathode materials for wholesale invasion of lithium-ion batteries in industries and household.

Other types of research presented by Dr. Ivanova concern the study of the corrosion behaviour of different steels in model aggressive environments and, as a result, their application as materials in different fields of industry, medicine and everyday life (e.g. mining, manufacturing and storage of liquid fertilizers, production of medical implants, etc.). Studies of this type will never lose their relevance.

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

In the publications presented by Dr. Ivanova, the formulated objectives of the research as a whole are scientific and applied. They can be classified in several directions:

1. Formation of functional coatings using modern methods and new synthesis materials - hybrid nanostructured sol-gel coatings using vinyltrimethoxysilane (VTMS) as a silicone precursor and testing their corrosion resistance; formation, properties and corrosion resistance of crystalline and amorphous phosphate coatings on low carbon steel by means of newly developed preparations; electrochemical synthesis of mixed oxides of zirconium, cerium and yttrium oxides, and investigation of their application as cathodes in the electrochemical synthesis of NaClO.
2. Investigation of the corrosion behaviour of various steels in model artificial environment.
3. Synthesis and characterization of intermetallic (Co-Sn, Ni-Sn, Co-Ni) nanoparticles and nanocomposites based on carbon matrix.
4. Synthesis of MnO₂-based spinel modified with Mg with a composition LiMg_{0.05}Mn_{1.95}O₄, alloyed lithium cobaltates LiCo_{1-y}M_yO₂ (M = Mn, Ni, y = 0.1, 0.3, 0.5), and studying their application as cathodes for lithium-ion batteries.

The development of modern technologies in the direction of obtaining new and improving the qualities of the traditionally used materials applied in various fields of industry and everyday life is the basis of Dr. Ivanova's research work. From the review of the publications submitted, it is clear that the objects identified for research are of scientific and practical interest in the field of corrosion research, anticorrosion and other functional coatings, nanomaterials, and lithium-ion batteries. As a result of the considerable amount and variety of studies, good experimental results have been obtained, accompanied by

appropriate conclusions, which is an indisputable evidence of the achievement of the aims set.

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	×
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.

Scientific and applied contributions: research into objects of current scientific and practical interest that can be applied in the field of corrosion protection, nanotechnology, lithium-ion batteries, and electrochemical synthesis.

1. Crystalline phosphate coatings in newly developed Ni-phosphate modified preparations exhibit the highest thickness and rate of formation, as well as the better corrosion resistance compared to manganese and calcium phosphates.
2. In studying the influence of various factors on the formation, composition and morphology of amorphous phosphate coatings on aluminum and low-carbon steels, in newly developed preparations, it has been found that increasing the temperature and lowering the pH lead to an increase in the thickness of the formed phosphate layers. The elemental composition of the coatings has been determined, on the basis of which assumptions are made for the formation of different compounds in the coatings composition.
3. The relationship between the susceptibility of low carbon steel (0.17% C) to stress corrosion cracking and the composition of corrosion products, in ammonium nitrate solutions, at different potentials has been investigated by Mössbauer spectroscopy. At potentials outside the region of the highest sensitivity to corrosion cracking, where the resistance of the steel to corrosion cracking increases significantly, the film contains oxides of spinel structure Fe_3O_4 and $\gamma\text{-Fe}_2\text{O}_3$.
4. Hybrid nanostructured sol-gel coatings on steel have been synthesized using vinyltrimethoxysilane (VTMS) as silicone precursor and methyl methacrylate (MMA) or hydroxyethylmethacrylate (HEMA). The coating has been shown to

affect both partial corrosion reactions, with a greater effect on anode dissolution, with the effect described being more pronounced in coatings formed with methyl methacrylate.

5. The synthesis of intermetallic (Co-Sn, Ni-Sn, Co-Ni) nanosized particles and nanocomposite materials based on them using a carbon matrix (substrate) is a significant contribution, referring to the high impact factor of the journal and the citation number as well. Using modern analytical methods, it has been found that nanoscale particles are characterized by a relatively large specific surface area, regardless of the elemental composition. Data on the morphology, size, and specific surface area of the particles indicate that they can find a wide variety of applications as catalysts, electrode materials in lithium-ion batteries, and as magnetic materials for biomedical applications.
6. Synthesis of MnO₂-based spinel modified by Mg with composition LiMg_{0.05}Mn_{1.95}O₄ has been synthesized and found to be a highly efficient cathode material for lithium ion batteries at elevated temperatures. The structure and electrochemical properties of alloyed lithium cobaltates LiCo_{1-y}M_yO₂ (M = Mn, Ni, y = 0.1, 0.3, 0.5) have been also investigated, with potential applications as cathodes in lithium-ion batteries. LiCo_{0.9}Mn_{0.1}O₂ has been found to perform better than other test compounds in terms of specific capacity and number of charge-discharge cycles.
7. The Zr, Ce and Y oxides, obtained from alcohol solutions, are electrochemically characterized by SEM and XPS. It has been found that a steel cathode with a coating of 1-2 μm ZrO₂-CeO₂-Ce₂O₃ enables a significant improvement in the catalytic activity of the cathode in the preparation of NaClO, as compared to a cathode of steel alone.

Contributions of applied nature: research of objects having application in various spheres of material production, mining and biomedicine.

1. It is shown that the highest corrosion rate of plastic deformed steel in sulfuric acid model solutions corresponds to 40-50% deformation region.
2. A comparative study has been performed on the corrosion behavior of carbon steel, st. 25, and the newly developed low-alloyed steel KR-355 (0.96% Cr, 0.36% Cu), intended as structural materials for the mining industry, in model environments containing the main aggressive components in mining waters. Steel KR-355 has been found to have higher mechanical strength and higher corrosion resistance in all test environments.
3. The corrosion behaviour of low carbon steel (0.17% C) in aqueous solutions of liquid manure at various concentrations and temperature has been investigated. As a result, this type of steel can be recommended as a good and relatively inexpensive structural material for the manufacture of installations, equipment, tanks and other equipment used to handle liquid manure.
4. A comparative study of two austenitic stainless steels (Cr18Ni9 and Cr18Mn12N) has been performed in two model artificial media (saliva), with potential applications as implants in biomedicine. Cr18Mn12N steel has been shown to exhibit higher corrosion resistance in the studied environment.

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	
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	×
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.

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1.7. Critical notes:

A) Lack of critical notes	8 points	
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	×
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

Based on the materials presented and the results obtained, I would definitely like recommend to the Respective Jury, to elect Assistant Professor Dimka Ivanova, PhD, as "Associate Professor" in the scientific specialty 5.10 Chemical technologies (Chemical resistance of materials and corrosion protection).
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2. Report for the candidate:

academic position	scientific degree	name	middle name	last name

The structure of the report under the previous point 1 shall be respected.

3. Report for the candidate:

academic position	scientific degree	name	middle name	last name

The structure of the report under the previous point 1 shall be respected.

Candidate ranking (in case of more than one candidate who has received a positive evaluation to occupy the academic position):

Based on the assigned points, the candidates who have received a **positive** evaluation are ranked as follows:

1	Assist. Prof.	PhD	Dimka	Ivanova	Ivanova	73
place	academic position	scientific degree	name	middle name	last name	points
2						
place	academic position	scientific degree	name	middle name	last name	points
3						
place	academic position	scientific degree	name	middle name	last name	points

	The report was written by:	
date		signature