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	Ch.Assistant	Dr,	Vasil	Ivanov	Karastoyanov	UCTM - Sofia
№	academic position	scientific degree	name	middle name	last name	workplace

Scientific area:

4	Natural Sciences, Mathematics and Informatics
code	Name

Professional area:

4,2,	Chemical Sciences
code	Name

Scientific specialty:

Physical Chemistry

The competition has been announced:

No.23	19.03.2024	Physical Chemistry	Faculty of Chemical Technologies
in SG issue	date	for the needs of the Department	Faculty

The report was written by:

Prof.	Dr.	Ekaterina	Nikolaeva	Zhecheva	IGIC-BAS
academic position	scientific degree	name	middle name	last name	Workplace

1. Report for the candidate:

Ch,Assistant	Dr,	Vasil	Ivanov	Karastoyanov
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.
In the competition for associate professor the candidate participated with 16 scientific papers. It is noteworthy that the journals in which these papers were published belong to the first quartiles. Thus, of the 6 publications included in the habilitation thesis, 3 belong to Q1 journals and three to Q2 journals. There are 10 publications beyond the habilitation thesis, of which 5 are in Q1 journals and 4 are in Q2 journals. The candidate has submitted a list of 157 independent citations on the competition publications. He is the author of one university textbook. All publications presented by Dr. Karastoyanov are on the subject of the competition. The candidate fulfils the minimum national requirements specified in the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its Application for holding the academic position "Associate Professor" in the scientific field "Natural Sciences, Mathematics and Informatics", professional field "Chemical Sciences", as well as the Rules on Acquisition of Academic Degrees and Occupation of Academic Positions at the University of Chemical Technology and Metallurgy – Sofia, The distribution by indicators is as follows: indicator A1 - 50 points; indicator C4 - 135 points (100 points required); indicator D7 - 220 points (200 points required for D5-10); indicator E11 - 314 points (50 points required) and indicator F20 - 20 points.

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	X
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 candidate's scientific activity is in the field of electrochemistry and in particular corrosion science and anodic oxidation of metals. His research is fundamental but is related to real and significant practical problems - the evolution of corrosion processes on the surface of structural materials and the preparation of new and improved functional materials based on anodic oxide films. This defines the candidate's research as certainly topical. The large number of citations of Dr. Karastoyanov's works in the literature (157) is also proof of relevance and importance..

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 candidate's research is in the following main areas: - Experimental characterization and modelling of corrosion processes in nuclear reactor structural materials; - Modelling of the processes of formation of anodic oxide films on valve metals; - Preparation and modification of nanoporous anodic oxide films for use as catalysts for water photoelectrolysis. The research objectives are realistic and they have been realized by an appropriate combination of experimental methods (in-situ electrochemical and photo-electrochemical studies and ex-situ physico-chemical measurements) with modelling of electrochemical processes..

1.4. Candidate research contributions:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	X
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.
The contributions of the candidate's research are both scientific and applied and can be summarized as follows: - Based on the mixed conductivity model, a quantitative procedure has been proposed to describe the surface corrosion of the structural materials in the first loop of nuclear reactors. A combination of in-situ impedance spectroscopy and data from X-ray photoelectron spectroscopy analysis was used to characterize experimentally these processes. The kinetic and transport parameters of the components in the metal oxide films on stainless steel and zirconium alloys were calculated. The considerations of mechanical stresses in oxide growth and space charge of aliovalent impurity elements allow to rationalize the dependence of transport parameters on layer thickness. - The effect of water chemistry on the oxidation of nickel alloy 690 under conditions simulating a high-temperature functional test of a pressurized water nuclear reactor is shown. The kinetic and transport parameters of oxide film formation are evaluated within the framework of a mixed conductivity model. An optimal water-chemical test regime with low to medium lithium content and boron addition is proposed, which produces films with better electrochemical stability and corrosion resistance. - The flow-assisted corrosion of carbon steels was investigated by in-situ electrochemical impedance spectroscopy under conditions simulating those in the steam generators of nuclear power plants. A parameterized quantitative kinetic model of the process is also proposed. The obtained experimental and computational results show that the flow-assisted corrosion of carbon steels is governed by oxide dissolution and formation of liquid corrosion products at the protective layer/heat carrier interface. Expressions for the film growth and corrosion release processes are proposed, - A quantitative model of the sludge formation on the steam generator construction materials is developed. In-situ electrochemical impedance spectroscopy was applied to quantify the kinetics of magnetite deposition on stainless steel under conditions simulating those in a steam generator. The proposed model is parameterized by comparing the mixed conductivity model with experimental data. - It is shown that using anodic oxide films on stainless steel, prospective photo-anodes for light-assisted electrochemical splitting can be fabricated. Thin bilayer films were prepared on austenitic stainless steel, with the outer layer being close to pure Fe_2O_3 and the inner layer enriched in Cr and Mo. The films absorb visible light and are good photocatalysts for hydrogen peroxide oxidation. - Based on in situ electrochemical and photo-electrochemical measurements combined with X-ray photoelectron spectroscopy data, a parameterized quantitative model of oxide film

growth on titanium and titanium alloys in fluoride-containing electrolytes is proposed The model allows to extract information on the rate-determining steps of the passive film formation, growth and restructuring and to assess the importance of the obtained parameters for the process kinetics.. The recombination rate constants of ionic defects at the film/solution interface and the dynamics of electron current carriers during film growth and dissolution can be evaluated within the model.

- Nanoporous titanium oxides were synthesized by anodic oxidation in an ethylene glycol-water-ammonium fluoride electrolyte, characterized, and modified, It was found that non-stoichiometric TiO2 films containing significant amounts of aliovalent cationic impurities of Mo and Nb are formed on a β-21S titanium alloy, which affect the ionic and electronic processes during film growth and dissolution and act as recombination centers. By modifying nanoporous TiO2 with molybdenum oxide, absorption of visible light significantly increases. Pulse electrodeposition of Cu oxide on nanoporous anodic TiO2 has an impact on photo-induced carrier dynamics and fabricates materials with photocatalytic activity towards water reduction with hydrogen production.

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 materials submitted by Dr. Vasil Karastoyanov for the competition meet the requirements for the academic position of Associate Professor in the professional field 4.2. Chemical Sciences at the University of Chemical Technology and Metallurgy - Sofia. Precise and in-depth research has been carried out on topical issues that are scientifically important and have practical relevance. The scientific and applied contributions are substantial, they are subject of numerous citations and demonstrate the candidate's subject expertise. The candidate has an intensive educational and pedagogical activity. Therefore, I strongly recommend Assistant Professor Dr. Vasil Karastoyanov to occupy the academic position of Associate Professor in professional field 4.2. Chemical Sciences and scientific specialty Physical Chemistry at the University of Chemical Technology and Metallurgy - Sofia.

	The report was written by:	
02.07.2024	**Prof, Dr, Ekaterina Zhecheva**	Signature