

# SOUTH-WEST UNIVERSITY "NEOFIT RILSKI"

## STATEMENT

by Prof. Dr. Ekaterina Nikolaeva Zhecheva  
from the Institute of General and Inorganic Chemistry – BAS  
on the competition for the academic position "Associate Professor"  
in the professional field 4.2. Chemical Sciences (General and Inorganic  
Chemistry), announced in the State Gazette no. 57/ 04.07.2023  
by the South-West University “Neofit Rilski” – Blagoevgrad

Regarding: scientific, applied scientific and professional academic activity and output,  
presented by Dr. Elitsa Yordanova Chorbadzhiyska

### **I. Summarized data on the scientific output and the activity of the candidate**

One candidate – Ch. Assistant Professor Dr. Elitsa Yordanova Chorbadzhiyska from the South-West University “Neofit Rilski” – Blagoevgrad (SWU), Faculty of Science and Mathematics, Department of Chemistry, participates in the competition for the selection of an Associate Professor in the professional field 4.2 Chemical sciences (General and Inorganic chemistry) announced by SWU in SG No. 57/04.07.2023. The documentation presented for the competition is prepared correctly, clearly and in accordance with all requirements and recommendations.

The candidate Ch.Assist.Prof. Dr. Elitsa Chorbadzhiyska graduated in the year 2009 from SWU as Magister in Chemistry (Masters’s Degree Program “Biologically active substances and medicines”). She has an additional professional qualification as Chemistry Teacher. The academic career of Dr. Chorbadzhiyska took place at SWU, first as Assistant Professor and then as Ch, Assistant Professor. In 2005 she defended a PhD thesis entitled “New electrocatalysts for bio-electrochemical hydrogen production” (PhD program “Inorganic Chemistry (Electrocatalysis)”) under the supervision of Prof. Dr.Sci. Mario Mitov and Assoc. Prof. DrSci. Yolina Hubenova.

Ch.Assist.Prof. Chorbadzhiyska has co-authored a total of 38 articles, 24 of them being listed in the Scopus database. According to the candidate, the total number of citations for all the scientific papers is 173 (self-citations excluded), and her Hirsch factor is 6 (Scopus). Her scientific interests are in the field of electrocatalysis, hydrogen production, electrochemical power sources, electrochemical and bio-electrochemical systems.

The applicant participates in the competition for Associate Professor with 19 publications, 7 of them being included in the habilitation work. Seventeen papers are with an Impact Factor (IF) and two are with an Impact Rank (SJR). The candidate has published in the highly rated Journal of Power Sources (IF=7.308), *Electrochimica Acta* (IF=6.776), *Bioelectrochemistry* (IF=5.423), *Electrochemistry Communications* (IF=5.032), *International Journal of Hydrogen Energy* (IF=3.956). The journal where the candidate has published most often is *Bulgarian Chemical Communications* – 10 papers. The results are also presented at 33 international and national scientific forums.

The candidate has presented for the competition a list with 30 citations. According to the Scopus database, the number of citations belonging to the papers for this competition is much greater – about 140. Documents are also attached concerning her participation in two projects of the National Science Fund, one of which she was the leader.

Ch.Assist.Prof. Chorbadzhiyska has an intense teaching and pedagogical activity that is reflected in the documents for the competition. She is lecturer of the courses “General Chemistry” and “Colloidal Chemistry” (compulsory for bachelor students), “Innovative methods for energy storage and conversion” (compulsory for a Master’s program) and of 5 optional courses (215 hours lectures and 655 hours practicum as a total).

A check-up is presented for the compliance of the scientific asset of the applicant with the requirements for occupying the academic position “Associate Professor” in the professional field 4.2 Chemical Sciences specified in the Rules of SWU for Academic Staff Development. Scientometric data of Ch.Assist.Prof. Chorbadzhiyska meet the requirements of SWU.

## **II. Evaluation of the scientific and practical results and contributions in the creative output presented for the competition**

The results of the candidate presented for the competition refer to the elaboration of new electrode materials and the development of green electrochemical and bio-electrochemical systems for electric current generation and hydrogen production. The main contributions are as follows:

A large number of bi- and ternary nanocomposite catalysts based on noble and transition metals supported on electrically conductive substrates are synthesized and studied as potential cathodes for hydrogen production by microbial electrolysis. NiW and NiMo electrodeposited on Ni foam are found to be among the most perspective cathode catalysts for microbial electrolysis cells. A microbial electrolyzer with NiMo, NiW/Ni cathodes was assembled and cathode efficiencies for the hydrogen evolution reaction are achieved that close or exceed the values reported in the literature for non-platinum catalysts.

New composite anode catalysts for direct borohydride electrooxidation and for alkali sulfide fuel cells are proposed, namely Pd-Au/ modified Ni foam and NiW based compositions.

Yeast-based biofuel cells have been developed using yeast as a biocatalyst and the formation of an electrochemically active anodic biofilms during their operation has been demonstrated. The conditions for formation of biofilms with high electrochemical activity are optimized.

The possibility of developing technology based on microbial fuel cell which enables simultaneous regeneration of copper and purification of biodegradable organic substances in wastewater is confirmed. For this technology, no additional energy input and pre-concentration are needed.

An experimental proof on the applicability of the so-called “microbial electrochemical snorkel” for the regeneration of metals from their aqueous solutions is provided for the first time. Copper, silver or gold solutions are investigated and it has been shown that the efficiency of the metal regeneration increases by short-circuiting the cathodes of the sediment microbial fuel cells with the bio-anodes

All publications in the competition are collective, but the role of the candidate in them is well outlined. In addition to their scientific importance, the obtained results have a well-defined practical potential concerning the application of the developed electrocatalysts in real electrochemical systems.

### **III. Critical notes and recommendations**

I have no general objections and recommendations to the research work of Ch.Assist.Prof. Chorbadzhiyska.

### **IV. Conclusions**

Ch.Assist.Prof. Elitsa Chorbadzhiyska participates in the competition with an asset that fulfills the requirements for occupying the academic position of Associate Professor in the professional field 4.2. Chemical Sciences at SWU. She performs topical studies that are part of the systematic research of the Department of Chemistry at SWU on green chemical power sources and bioelectrochemical systems for electric current generation and hydrogen production. The scientific contributions are significant, with a good impact on the literature and have a potential for real practical application. The candidate has an intense teaching and pedagogical activity. Based on all the above, I evaluate the application positively and strongly recommend Ch. Assistant Professor Dr. Elitsa Yordanova Chorbadzhiyska to be appointed at the academic position of "Associate Professor" in professional field 4.2. Chemical sciences (General and Inorganic Chemistry) at the South-West University "Neofit Rilski"-Blagoevgrad.

Member of the Scientific Jury:

Prof. Dr. Ekaterina Zhecheva

06.10.2023