

OPINION

on the competition for the academic position "Associate Professor", scientific direction 4.2. Chemical Sciences, specialization "Electrochemistry" at the Institute of Physical Chemistry, Bulgarian Academy of Sciences,

announced in SG Issue №62/27.07.2021,

Candidate (s): Nelly Dimitrova Boshkova, Dr., Assist. Professor.

Member of the Scientific Jury: Dimitar Spassov Stoychev, PhD, DSci, Professor

1. GENERAL CHARACTERISTIC OF THE RESEARCH AND APPLIED RESEARCH ACTIVITIES OF THE CANDIDATE

The scientific-investigation interests of Assist. Prof. Dr. N. Boshkova are focused thoroughly in two areas: I. Improvement of the corrosion stability and protective ability of low carbon steel by electrodeposited galvanic and/or composite (hybrid) coatings; inhibitors of corrosion; conversion passive films and II. Obtaining and corrosion characterization of protective systems based on sol-gel coatings.

As a result of her and co-author's investigations to the moment are published commonly 41 scientific papers. These articles are published preferably in foreign journals, more of which with IF or SJR, as well as in full text in collections of reports of symposia, congresses and conferences with Bulgarian and international participation. She is co-author of four articles which are chapters of books. She is also co-author of one Bulgarian Patent. To the moment these publications have 80 citations from Bulgarian and foreign authors. All published to the moment articles correlate with one of the basic thematic priorities of the IPC-BAS concerning avant-garde materials and technologies based on the electrochemically obtained metal, alloy's and modified polymer coatings with protective, decorative and electro-catalytic properties. Their overview shows that they as a quantity and quality implement the minimal national demands, including those demanded by BAS and these defined by Sci. Council of IPC-BAS.

2. MAIN SCIENTIFIC AND APPLIED SCIENTIFIC CONTRIBUTIONS

The scientific contributions of Assist. Prof. Dr. N. Boshkova can be summarized as follows:

- It is found and optimized conditions of electrodeposition (composition of the electrolytes, pH, current density, temperature) of Zn coating from low acid electrolyte, as well as any binary alloys of this metal. Experimentally are confirmed better corrosion resistance of these alloys in compare with pure Zn coatings. The results obtained are explained by formation of low soluble corrosion products on the surface of coatings;
- It is established electrochemical conditions of deposition of composite Zn coatings including four types of polymer particles (PP), obtained on the base of two- or three-block's core-shell type co-polymers. It is studied the influence of PP on the cathode and anode processes of deposition and dissolution. It is found the formation of mixed film containing zinc hydroxy-chloride and PP. The latest are stable and their presence in the

- film contribute to the transformation of local corrosion to general corrosion, which is different behavior in compare with pure Zn coatings;
- In the same manner are obtained and characterized Zn alloys coatings Zn-Co and Zn-Mn. At this is established the influence of PP inclusions on their corrosion resistance. It is shown that the presence of PP in the Zn-Mn alloy improves its corrosion parameters;
 - Zinc composite coatings, containing included: polymer nano-containers, holding inhibitor benzotriazol; nucleus of kaolinite or ZnO, are obtained by the technique „layer by layer”. At this are realized systems in which the sub-layer is deposited directly to the protected steel substrate of low carbon steel. As a result of this have reached barrier effect to the penetration of Cl ions in dept. It is found improved protective characteristics of the coating – more long anodic curve at external polarization and higher value of the polarization resistance in compare with ordinarily zinc coating;
 - It is found Zinc composite (hybrid) coatings characterized by included of different types inorganic and organic particles – ZnO, CuO, PANI, carbon sphere, carbon nanotubes – increasing anticorrosion parameters of ordinarily zinc coating;
 - It is synthesized and studied nitrogen-containing heterocyclic di-cation compounds characterized by antioxidant properties. By electrochemical polarization methods is studied and proved their inhibiting action against corrosion for protection of steel and galvanized steel;
 - The possibilities for prepare of a Cr³⁺-containing and Cr-free conversion layers on Zn and Zn-Co alloy with low concentration of Co are explored and described;
 - It is achieved increase corrosion stability of low carbon steel by means of multi-layer ecological systems with barrier properties based on sol-gel coatings of ZrO₂ (upper, superficial layer) and TiO₂ (under layer).
 - It is conducted investigation and corrosion monitoring of austenitic (18Cr10NiTi) and low carbon (38GN2MFA) steels, applied in constructions of NPS “Kozloduj” (in model corrosion medium, containing typical for these power station corrosion agents).

3. IMPACT OF THE CANDIDATE'S SCIENTIFIC PUBLICATIONS IN THE BULGARIAN AND FOREIGN LITERATURE

On the publications of Dr. Boshkova and co-authors to the moment are registered 80 citations. From the presented documents the candidate substantially exceeds the requirements for “ASSOCIATE PROFESSORSHIP” according to the Rulles of IPC-BAS.

4. CRITICAL REMARKS AND RECOMMENDATIONS TO THE SCIENTIFIC PAPERS OF THE CANDIDATE

I have not critical notes to the scientific papers of the Candidate.

5. CONCLUSION

Assist. Prof. Dr. N.Boshkova has prepared a tabulated Summary for met minimal national requirements, as well as the guidelines determined by the IPC - BAS. From the presented Summary, candidate answers to the requirements for "ASSOCIATE PROFESSORSHIP" across all indicators (A, B, C, D and E).

In volume, quality, scientific and applied contributions and by scientific metrics, the candidate's accomplishments satisfy the requirements by the Law for a "Associate Professorship" under the Guidance for the conditions and regulations for the acquisition of scientific degrees and academic appointments at IPC-BAS. On the basis of all points of presented documents and results, as well as the quantitative information about scientific activities, I am pleased to recommend to the respected members of the Scientific Review Committee that they grant Assist. Prof. Dr. Nelly Dimitrova Boshkova the academic title of "ASSOCIATE PROFESSOR", scientific direction 4.2 Chemical Sciences (specialization Electrochemistry) for the needs of division "Electrochemistry and Corrosion" at IPC - BAS.

15.11.2021
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