



STANDPOINT

for the awarding the academic degree "Doctor" in Professional field 4.2. Chemical sciences, Electrochemistry

Title of the PhD thesis: "Deposition and characterization of Ni-P coatings on different types of substrates"

with candidate: Veselina Petrova Chakarova, Institute of Physical Chemistry, Bulgarian Academy of Sciences

Member of the scientific jury: assoc. prof. Georgi Vyacheslavovich Avdeev, Institute of Physical Chemistry, Bulgarian Academy of Sciences

1. General characteristics of the research and applied activities of the candidate.

Veselina Chakarova holds a Master's degree from the University of Chemical Technology and Metallurgy, Sofia, Department of Electrochemistry and Corrosion. In 2011, she started working at the Institute of Physical Chemistry, BAS. Shortly after, she began working on topics related to the presented dissertation. It contains 111 pages of text, including 64 figures and 35 tables. 120 literary sources are cited. Title of the PhD thesis is "Deposition and characterization of Ni-P coatings on different types of substrates."

From the submitted report on the fulfillment of minimum requirements of the Institute of Physical Chemistry "Acad. R. Kaishev" - BAS to the scientific activity of candidates for the acquisition of the educational and scientific degree "doctor", it is seen that Ms. Chakarova not only fulfills all the conditions, but also significantly exceeds them in some indicators. Indicator A is fulfilled with 50 points. Indicator D with a minimum number of 30 points, 79 are presented - more than twice as many. Indicator D is not mandatory, but 16 points are presented there too.

2. Main scientific and applied contributions.

The area of research conducted is relevant. From a brief review of the literature, in the last few years there has been a focus on obtaining alloys of the elements of the iron group and studying their promising mechanical, chemical and magnetic properties. Special attention is paid to nickel-phosphorus (Ni-P) alloys, which are very attractive due to their good corrosion and mechanical resistance. This makes them suitable materials for their application in many technological applications. In addition, one very important advantage of electrochemical methods of electroless deposition should be noted, they are inexpensive techniques and allow obtaining very uniform coatings. The research conducted by Eng. Chakarova enriches already existing

knowledge and theories. In addition, they have an applied focus and if used, would realize an economic and social effect.

The reading of the dissertation allows us to emphasize some significant contributions of the candidate. 1) Thanks to the research, abrasive materials based on composite chemical Ni-P coatings with different composition and size of dispersoids on a flexible polyethylene terephthalate (PET) substrate were obtained; 2) Working conditions were established under which chemical Ni-P coatings with better electrocatalytic properties were deposited compared to electrodeposited nickel with respect to the hydrogen evolution reaction in alkaline and acidic environments were studied; 3) The corrosion behavior of thin chemical Ni-P coatings with different phosphorus contents in acidic, neutral and alkaline environments was studied; 4) An original method for wiring activated ABS by processing in an alkaline solution containing nickel sulfate and citric acid at a temperature above 40° C was proposed.

3. Citations of the candidate's scientific publications in Bulgarian and foreign literature

According to the presented data, Eng. Chakarova has been cited over 50 times, with the majority of the citations being in publications referenced in international databases. There are 8 citations for the works presented in the dissertation. All this clearly indicates that the candidate's works are read and used by the international community.

4. Critical remarks and recommendations to the candidate's scientific works.

None

CONCLUSION

The presented dissertation is very well structured. The goals and objectives are clearly and briefly stated. The results obtained are original and valuable for the international community. They enrich already existing knowledge and theories and have an applied focus. The dissertation meets all the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADSRB), the regulations for its implementation and the Regulations of the Institute of Physical Chemistry, Bulgarian Academy of Sciences.

The submitted thesis meets all the requirements for the award of the degree of Doctor according to the Law on Academic Staff Development in Republic Bulgaria and the corresponding Regulations for its application. Therefore, as a member of the Scientific Jury, I fully support the awarding of this degree to Eng. Veselina Petrova Chakarova in scientific specialty 4.2. Chemical Sciences ("Electrochemis")

Date: 21.01.2025

Assoc. Prof. Dr. Georgi A