

REPORT

by

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Member of the Academic Jury set to render a decision on the competition for filling the academic position of Associate Professor in the Professional Field **4.2. Chemical Sciences** according to the Classifier of the Areas of Higher Education and the Professional Fields (Scientific Specialty "Polymers and Polymer Materials")

This Report is prepared in response to Order № ПД-09-28 of 21.02.2023, issued by the Director of the Institute of Polymers, Bulgarian Academy of Sciences, following the decision made by the Academic Jury that was held on 02.03.2023.

The Report is in compliance with *Development of Academic Staff in the Republic of Bulgaria Act (DASRB)*, the *Rules for the Application of the Development of Academic Staff in the Republic of Bulgaria Act*, the *Rules of BAS* and with the *Rules set at the Institute of Polymers, Bulgarian Academy of Sciences, for applying the Act aforementioned*.

Assistant Professor Dr. Ivelina Tsankova Tsacheva is the only candidate in the announced competition for occupation of academic position "Associated Professor" in the Department "Polymers for Alternative Energy and Environmental Protection" at the Institute of Polymers - BAS. She presents detailed and precise documentation of an active and promising scientist with indisputable indicators of academic development.

Dr. Ivelina Tsacheva began her scientific career in 2004 as a full-time doctoral student at Institute of Polymers, where in 2008 she obtained PhD degree and continues to work until now. The topic of her dissertation "Polymer radiation protection complexes: design, characterization and efficiency" meets the specialty of the announced competition.

The Dr. Tsacheva's scientific production includes 29 scientific publications, of which 2 are included in the PhD dissertation. In the competition, the candidate participated with 20 scientific articles published in international journals, indexed in Web of Science and SCOPUS, 19 of which have an impact factor and one is a chapter of a book published by Elsevier. According to Web of Science and SCOPUS metrics, the articles are distributed according to the respective quartiles as follows: 6 articles with Q1; 2 articles with Q2; 5 articles with Q3; 6 articles with Q4. The international journals with IF in which the scientific works of Dr. Tsacheva are published are prestigious journals in the international scientific literature: *European Journal of Medicinal Chemistry*, *European Journal of Pharmaceutical Sciences*, *Bioorganic and Medicinal Chemistry*, *Microporous and Mesoporous Materials*, *Journal of Drug Delivery Science and Technology*, *Advances in Materials Science and Engineering*. A list of 19 participations in scientific forums is presented, of which 11 in our country and 9 abroad. Dr. Tsacheva's citation reference includes 192 citations to 21 publications and an h index of 8 according to SCOPUS.

The scientometric analysis of Dr. Tsacheva's research activity is very precisely done, from which it is evident that she meets and even exceeds the minimum requirements for occupying the academic position of "Associate Professor" according to *Development of Academic Staff in the Republic of Bulgaria Act (DASRB)*, the *Rules for the Application of the Development of Academic Staff in the Bulgarian Academy of Sciences Act (Table 1)*. In addition, she has fulfilled the specific requirements according to the *Rules set at the Institute of Polymers for applying the Act*

aforementioned. With required 5 articles for the last 5 years, the candidate has presented 8 publications, of which 6 are in journals indexed in Web of Science and SCOPUS.

Table 1. Comparison of the scientometric data of Dr. Ivelina Tsacheva according to the Rules set at the Institute of Polymers

Indicators	Content	Required score in points	Applicant's score in points
A	PhD Thesis	50	50
B	Habilitation work - Scientific articles published in journals/books referred and indexed in Web of Science and Scopus (Q1) (Q2) (Q4)	100	107 75 20 12
Г	Scientific articles published in journals/books referred and indexed in Web of Science and Scopus that are not included in the Habilitation work (Q1) (Q2) (Q3) (Q4) (Book chapter)	220	75 20 75 60 15 245
Д	Citation in scientific journals, books, patents found in Web of Science and Scopus	60	192x2 = 384
TOTAL		430	786

Dr. Tsacheva's research activity has a clearly defined profile in the field of molecular synthesis of new polymer compounds with the function of biologically active drug carriers with the aim of improving their therapeutic potential and reducing toxic effects. Polymer-drug conjugates are promising tools to avoid the disadvantage of conventional treatment, such as side toxic effects, low water solubility, and small therapeutic window. In this aspect, the achievements derived from her research have a distinct applied potential for medicine and pharmacy.

The majority of scientific research (80%) of Dr. Tsacheva is devoted to the development of new polymer compounds with their own biological activity, which can be degraded into biocompatible and non-toxic components under physiological conditions. Contributions to indicator B are generated from her work on the synthesis and characterization of low molecular weight and high molecular weight aminophosphonates. The first group of aminophosphonates includes a new biologically active anthracene containing Schiff base, 9-anthrylidene-furfurylamine and its three aminophosphonate derivatives. They showed antiproliferative activity against carcinoma cell lines derived by human colon, mammary gland, bladder, urinary tract and the aminophosphonate N-methyl(dimethoxyphosphonyl)-1-(9-anthryl)]furfurylamine has higher activity, in comparison to the Schiff base from which it is derived. The compounds revealed

lower toxicity to healthy cells compared to the conventional anticancer agents. A logical continuation of the candidate's studies is the synthesis of a new class of biodegradable high-molecular carriers - polymers of aminophosphonate and PEG units. Four new polymers with pronounced antitumor activity and low cytotoxicity were obtained, and the one containing 2-furyl-p-toluidine fragment and poly(oxyethene H-phosphonate) has the structural prerequisites for the best antitumor activity.

Contributions to Indicator Γ are generated from Dr. Tsacheva's research, which continued and developed her work on the design of new anthracene-containing aminophosphonates as antitumor drugs. Interest in them is motivated by the fluorescent and intercalating properties of the anthracene ring and its valuable bioanalytical application for subcellular distribution and binding in healthy and tumor cells. Three new compounds were synthesized - bisaminophosphonates with pronounced antitumor activity on a colorectal carcinoma cell line and a moderate in vivo antiproliferative and clastogenic effect. Design of new polymeric carriers with improved properties logically follows and develops the candidate's previous research. Incorporation of biologically active aminophosphonate molecules to polyphosphoesters provides the possibility of obtaining polymer-drug conjugates with phosphoric ester bonds that can be easily degraded to biologically compatible components under physiological conditions. Newly synthesized poly(oxyethylene aminophosphonates) exert in vitro antitumor activity and in vivo antiproliferative effect. They exhibit lower cytotoxicity and clastogenicity than the corresponding low molecular weight aminophosphonates.

In the last 5 years, Dr. Tsacheva has been moving towards a new interdisciplinary direction - "nanomedicine" with her research on the modification of mesoporous nanoparticles as carriers for the controlled drugs release - quercetin and curcumin. The contribution is the preservation of the biological activity of the bound forms of the two substances in comparison with their free form.

Conclusion: Based on the submitted materials for the competition, I find that Assistant Professor Ivelina Tsankova Tsacheva, PhD is a prominent and promising scientist with expertise in the design of new polymer-drug conjugates. Based on her interdisciplinary research, original scientific contributions with high applied potential for medicine and pharmacy have been obtained. The scientific production of Dr. Tsacheva is of sufficient volume and high scientometric indicators, which is why it fully covers, even significantly exceeds the criteria in the Rule sets of the Institute of Polymers – BAS for applying the Development of Academic Staff in the Republic of Bulgaria Act for occupying the academic position "Associate Professor". Dr. Tsacheva is distinguished by active project activity, in which she has shown her skills to work in a team. This gives me reason to confidently recommend to the honorable Scientific Jury to vote positively for a proposal to the Scientific Council of the Institute of Polymers - BAS, Dr. Ivelina Tsacheva to be promoted into "Associated Professor" in Professional direction 4.2. Chemical Sciences (Polymers and Polymeric Materials)

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Report prepared by:
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Member of the Academic Jury