STATEMENT

on the competition for the academic position „Professor“ in the field of higher education 4. “Natural Sciences, Mathematics and Informatics”, professional field 4.2 “Chemical Sciences” („Polymers“) for the needs of the Faculty of Chemistry and Pharmacy at Sofia University "St. Kliment Ohridski”, announced in the “State Gazette”, issue 24 / 17.03.2023, p. 58.

by Associate Professor Dr. Ivanka Grigorova Dakova,
Faculty of Chemistry and Pharmacy at Sofia University „St. Kliment Ohridski”,
a member of the Scientific Jury, appointed by order № RD 162 / 06.04.2023 of the Rector of Sofia University "St. Kliment Ohridski”.

The only applicant in the competition is Assoc. Prof. Dr. Elena Dimitrova Vassileva from the Faculty of Chemistry and Pharmacy at Sofia University “St. Kliment Ohridski”, Department Pharmaceutical and Applied Organic Chemistry, Laboratory of Polymers. The materials presented by Assoc. Prof. Dr. Elena Vassileva are in compliance with the requirements of the Law for the Development of the Academic Staff in Republic of Bulgaria and the relevant regulations for its implementation. In addition the documents presented meet the criteria of Regulation for the Terms and Conditions for Acquiring Scientific Degrees and Occupying Academic Positions at Sofia University "St. Kl. Ohridski” and the Recommended Criteria for Acquiring Scientific Degrees and Occupying Academic Positions at Sofia University “St. Kl. Ohridski” for Professional field 4.2 “Chemical Sciences”.

Elena Vassileva obtained her M.Sc. degree in 1995 from the Faculty of Chemistry, Sofia University. In 2000 she successfully defended hir doctoral thesis entitled „Studies on some physico-mechanical properties and biodegradation of modified gelatin“ and is awarded the PhD degree. She works as a lecturer and researcher at Department Pharmaceutical and Applied Organic Chemistry (Laboratory of Polymers) occupying consequently the positions Assistant Professor (2003-2004), Senior Assistant Professor (2004-2005), Head Assistant Professor (2005-2008) and Associate Professor (since 2008). The candidate has completed many specializations at different universities in Italy, Germany, Spain, and USA. She has received numerous awards.

Assoc. Prof. Vassileva is a co-author of 48 scientific publications, 39 of which are in journals with impact factor, and two are book chapters (in the international publishers Springer Verlag and Wiley). According to data submitted by the candidate, the scientific publications have 716 citations and her h-index is 13 according to the Scopus database. She participates in the competition for a professor position with 15 publications (7 Q1, 7 Q2, 1 Q3; total impact factor 51.96) and one book

chapter. The candidate is the lead author (first author and/or corresponding author) in 11 articles. The citations of the articles submitted for the competition are 68 (Scopus, exclude self-citations).

The presented habilitation thesis entitled “Polyzitterions and materials based on them with application in medicine and pharmacy ” is based on 5 publications in which the candidate is a lead researcher. It describes the synthesis and characterization of new polymeric materials based on polyzwitterions (PZI). The relationship between the zwitterionic nature of the monomeric units and the resulting properties of PZI is established, which make them "smart" polymer materials and determine the possibility of their application as chronic wounds dressing materials and modified drug release materials. The presented work is in a clearly defined area and with the candidate's own achievements.

The main areas of scientific interests and research of Associate Professor Vassileva are in the field of synthesis and characterization of the structure and properties of 3 groups of new polymer materials, as well as their application in medicine. The scientific contributions can be summarized in the following main areas:

1. Synthesis, characterization and application of polyzwitterionic hydrogels (PZI)

- New polyzwitterionic hydrogels based on poly(sulfobetaine methacrylate) (PSB) or poly(carboxybetaine methacrylate) (PCB) cross-linked with poly(ethylene glycol) are synthesized. It is demonstrated that the developed hydrogels can be used as chronic wound dressing materials due to their excellent antibiofilm activity and non-adherent properties.
- Copolymer hydrogels, based on sulfobetaine methacrylate, vinyl pyrrolidone and poly(ethylene glycol) diacrylate, are successfully synthesized for the first time. The novel copolymer networks demonstrate composition dependent swelling kinetics. They are found to be suitable materials for making soft contact lenses to be used in ocular timolol maleate delivery.

2. Synthesis, characterization and application of interpenetrating polymer network (IPN)

- Novel IPNs based on poly(acrylic acid) (PAA) or poly(methacrylic acid) (PMAA) and polyacrylamide (PAAM) are synthesized and applied as drug delivery systems for verapamil hydrochloride (VPM). The mechanism of interaction between VPM and the components of IPN has been clarified. It is found that the network density and functionality of the components forming IPNs (PMAA/PAAM and PAA/PAAM) influence both their smart behavior and their properties as verapamil hydrochloride (VPM) delivery systems. Novel poly(2-(dimethylamino) ethyl methacrylate) (PDMAEMA) and polyacrylamide (PAAm)-based IPNs with different compositions are synthesized, characterized and applied as diclofenac sodium delivery systems. The IPNs’

composition is shown to determine the swelling behavior of these novel materials, and the inclusion of the charged IPN component (PDMAEMA) has changed the water molecules type diffusion.

- IPNs of PAA and PAAM are used for the first time as templates for *in situ* calcium phosphate deposition in an attempt to mimic the naturally occurring biomineralization. The obtained new inorganic–organic composite materials are characterized and their further potential in the fields of bone regeneration and substitution is revealed.

- IPN based on poly(carboxybetaine methacrylate) and poly(sulfobetaine methacrylate), is synthesized and characterized for the first time. This material demonstrates the ability to expand or shrink in response to changes in three "biological" external stimuli such as temperature, pH, and salt concentration.

- ^{1}H HRMAS NMR spectroscopy is applied to gain insight into the chemical and morphological structure of double-network hydrogels, prepared from poly(2-acrylamido-2-methyl-1-propane-sulfonic acid) (PAMPS) and poly(acrylamide) (PAAm). The existence of strong hydrogen-bond interactions based on the N−H group of PAMPS as a hydrogen-bond donor and the C=O group of PAAm as a hydrogen-bond acceptor is demonstrated.

3. Synthesis, characterization and application of polymer particles

- Sonochemical method is successfully applied to gelatin and for the first time gelatin capsules (GCs) with micro- and nanosize are obtained by this method. The parameters affecting the size of the obtained GCs are found to be gelatin concentration, temperature, pH, and ultrasound irradiation time. GCs are successfully applied for encapsulation of two hydrophobic drugs, α-tocopherol and acetylsalicylic acid.

- Chemical and physical crosslinking have been used to prepare two types PZI particles based on PSB. The particles obtained are used as a drug delivery system for timolol maleate. The relationship between the PSB vehicles' structure and the timolol maleate release profiles is found.

- Three polyelectrolyte complexes (PECs) based on the biocompatible and biodegradable biopolymers chitosan and sodium alginate are obtained. The fibrillar form of the chitosan/alginate PECs is demonstrated to be appropriate for use as vehicle for controlled diclofenac sodium release.

- It is developed a novel bottom-up method for synthesizing particles of a variety of regular anisotropic shapes, sizes, and chemical compositions. The factors that determine the yield and the shape of the particles are type of the emulsion surfactant, initial droplet size, and time in cooling stage.

Assoc. Prof. Elena Vassileva demonstrate good project management experience. She has participated in 5 national and 6 international research projects in the period 2008-2023. The candidate

is the leader of 2 national, 3 international and 4 university projects. This large project activity convincingly speaks both about the relevance and competitiveness of the scientific topic developed by the candidate, as well as about her role as a leading researcher.

Assoc. Prof. Elena Vassileva is an experienced and respected teacher in the field of polymer science. She conducted lectures of courses such as “Polymers”, “Modern biomedical applications of polymers” and “Filmforming polymers” to B.Sc. and M.Sc. students from chemical specialties. She has supervised 7 successfully defended diploma students (BSc and MSc) as well as 2 PhD students.

The candidate is a member of the following organizations: International Union of Pure and Applied Chemistry (IUPAC), Marie Curie Alumni Association – MCAA and Union of Chemists in Bulgaria. Assoc. Prof. Elena Vassileva is a member of the Faculty Council and Pharmacy Council at Faculty of Chemistry and Pharmacy at Sofia University “St. Kliment Ohridski

Conclusion:

The presented overall scientific research, project and teaching activities and the fulfilled quantitative indicators quantitative indicators clearly show that Assoc. Prof. Dr. Elena Vassileva is a well-established and independent scientist, possesses a high professional level in the scientific specialty "Polymers", demonstrates very good capabilities to lead a team and conduct original scientific research on current and prospective topics. Based on the above, I am convinced of my positive assessment and suggest Associate Professor Dr. Elena Vassileva to be elected to the academic position of “Professor” in the professional field 4.2 Chemical Sciences (Polymers).

Sofia Writing the statement: .....

07.07.2023 Assoc. Prof. Dr. Ivanka Dakova