

REPORT

by assoc. prof. PhD eng. Polyana Mihaylova Miladinova

Member of the Academic Jury set to render a decision on a procedure for the acquisition of

Academic Degree (“Doctor of Philosophy” (PhD))

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”)

Author of the dissertation: Selin Erdinch Kyuchyuk-Hyusein

Topic: Electrospun fibers with core-sheath architecture based on poly(ethylene oxide), a biodegradable aliphatic polyester and beeswax

Scientific supervisors: Assoc. Prof. D. Paneva, Prof. I. Rashkov

This Report is prepared in response to Order № RD-09-125 of 01.10.2025 issued by the Director of the Institute of Polymers, Bulgarian Academy of Sciences, following the decision made by the Academic Jury.

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*.

1. Assessment of the scientific and research accomplishments of the candidate

The presented dissertation examines a significant and current scientific topic related to the creation of fibers with self-organized core-sheath architecture.

The dissertation is written on 148 pages, includes 70 figures. 123 literary sources are cited, of which over 25% after 2020. Based on the detailed literature review, clear and well-formulated goals and objectives of the dissertation have been derived.

The candidate uses a completely new method for creating fibers with self-organized core-sheath and core-double sheath architectures without the need for a coaxial nozzle by using homogeneous solutions containing polyethylene oxide, biodegradable aliphatic polyester and beeswax. Biologically active substances (5-nitro-8-hydroxyquinoline and 5-chloro-7-iodo-8-hydroxyquinoline) were introduced into the resulting fibers.

The dissertation abstract is presented in Bulgarian and English in a volume of 43, resp. 38 pages, and represents a shortened version of the essence of the dissertation, reflecting the research work carried out with a presented goal and objectives, methods and techniques of analysis used,

and main results obtained. The main observations and conclusions from the dissertation work are reproduced and the contributions of the dissertation research are adequately indicated.

The results of Selin Kyuchyuk-Hyusein have been summarized in 5 scientific publications (2 in Q1 and 3 in Q2 journals). Some of the results of the dissertation have been reported at seminars and scientific conferences (3 oral and 2 poster scientific presentations). A total of 20 noted citations is presented on the given scientific publications. The candidate has 1 patent and 1 utility model issued, as well as 3 participations in poster sessions on topics other than that of the dissertation. She is also a participant in 2 national contracts.

2. Main contributions of the dissertation work

- A new approach is presented for creating fibers with "core-sheath" and "core-double sheath" architectures by using homogeneous solutions containing polyethylene oxide, biodegradable aliphatic polyester and beeswax without using an additional coaxial electrospinning device.
- Using the new approach, structures "hydrophilic core - hydrophobic shell" (polyethylene oxide and beeswax) were obtained by electrospinning homogeneous solutions of the partners in their common solvent chloroform, as well as structures "hydrophilic core - hydrophobic shell" (polyethylene oxide and beeswax) with the included biologically active component - 5-nitro-8-hydroxyquinoline.
- Using the new approach, fibers with a "core-double sheath" architecture were obtained from polyethylene oxide, biodegradable aliphatic polyester poly(L-lactide) and beeswax by electrospinning homogeneous solutions of the partners, as well as "core-double shell" structures with an included biologically active component - 5-nitro-8-hydroxyquinoline or 5-chloro-7-iodo-8-hydroxyquinoline.
- The validity of the proposed approach for obtaining fibers with a "core-double sheath" architecture by replacing poly(L-lactide) with another biodegradable aliphatic polyester, such as poly(ϵ -caprolactone), poly(D,L-lactide-co-glycolide), polybutylene succinate and poly(3-hydroxybutyrate), has been proven.
- The antibacterial, antifungal and anticancer activity of new fibrous materials containing 5-nitro-8-hydroxyquinoline or 5-chloro-7-iodo-8-hydroxyquinoline was investigated. A preliminary "in vitro" screening was conducted on the possibility of applicability of the new fibrous materials, built from fibers with a "core-sheath" or "core-double sheath" architecture with an incorporated biologically active substance in the field of medicine or agriculture. It has been found that fibrous materials containing 5-nitro-8-hydroxyquinoline, regardless of the architecture of the fibers, exhibit antibacterial and antifungal activity, and those containing 5-chloro-7-iodo-8-

hydroxyquinoline - anticancer activity and may find potential application in medicine. For the first time, it has been shown that fibrous materials with both biologically active substances exhibit antimicrobial activity against both phytopathogens and microorganisms beneficial to plants and can find potential application in organic agriculture or the so-called "green" agriculture.

Considering the above, I believe that the presented doctoral dissertation contains valuable theoretical and scientific-applied results that correspond to modern achievements and represent a significant and original contribution to polymer science.

3. Opinions, notes and recommendations

I have no critical comments on the presented dissertation. The assessment I give is positive.

4. Conclusion

According on the grounds of the documentation presented by the candidate, on her publications reviewed and the above assessment, I recommend on the Academic Jury to render a positive decision for the acquisition of the Academic Degree PhD on Selin Erdinch Kyuchyuk-Hyusein.

31.10.2025

Report prepared by:

Assoc. prof. PhD eng. P. Miladinova

Member of the Academic Jury