

REVIEW

by

Prof. Elena Vasileva

Member of the Academic Jury set to render a decision
on a procedure for the acquisition of Academic Degree “Doctor of Philosophy”
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 Peer Review is prepared in response to Order № ПД-09-178 of 19.12.2024, 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 17.12.2024.

The Review 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*.

Assessment of the scientific and research accomplishments of the candidate

2.1. Assessment to meet the minimal criteria in accordance with Specific the Rules for Granting Academic Degrees set at the Institute of Polymers, Bulgarian Academy of Sciences, Application 1.

The dissertation fully meets the specific requirements of the Institute of Polymers, Bulgarian Academy of Sciences, namely:

- contains scientific and applied scientific results that represent an original contribution to the field of polymer science and related applications
- has the type and volume corresponding to the existing requirements in the field of polymer research
- comprises results included in two scientific publications (in Polymer degradation and stability and in Molecules), for which 7 citations have been noted so far. Both journals in which the results were published have a high impact factor (5.9 and 4.2, respectively) and are in the Q1 quartiles.

2.2. Assessment of the requirement for the doctoral thesis to contain valuable theoretical or applied science results that correspond to modern achievements and represent a significant and original contribution to polymer science.

The outlined contributions of the dissertation fully correspond to the described results. The contribution to the development of the proposed catalyst for PET glycolysis is enhanced by the use of green synthesis, i.e. microwave heating, which makes the process even more "green". The presented scientific research is very well planned, each step is well justified and follows logically from the set goal, the implementation is achieved with the help of appropriately selected methods for synthesis and characterization. All this shows deep thinking and precise work towards solving the problem set by the doctoral student and her supervisor.

2.3. Assessment of the scientific accomplishments of the candidates covering the merits to the fundamental and applied research, as well as to the relevance of the topic. The assessment also includes the personal contribution of the applicant/s.

The results obtained within the dissertation are clearly and precisely described and very well explained. The observed trends are correctly outlined and indicated, and the doctoral student has given correct and adequate explanations for all of them. The entire work follows a logical

structure and is complete, with all stages being well-founded and logically following one another. Thus, the doctoral student's ability to plan and conduct scientific research, which is at the same time detailed and precisely conducted, is convincingly demonstrated. The synthesized catalyst shows very good results regarding the glycolysis of PET, and the obtained decomposition products when using it show high purity. An adequate and suitable way for their utilization has also been found, which is demonstrated within the dissertation. All results of these studies support the set goal and show the correctness of the chosen approach.

2.4. Assessments of the scientific production of the candidate as well as the reflection of the results in the works of other authors.

The results obtained within the doctoral study are published so far in two scientific publications (in the journals *Polymer degradation and stability* and *Molecules*), for which 7 citations have been noted so far. Both journals in which the results were published have a high impact factor (5.9 and 4.2, respectively) and are in the Q1 quartiles which illustrates the high quality of the performed research.

3. Assessment of the qualities of the extended abstract of the doctoral thesis, whether it correctly reflects the contributions of the doctoral thesis

The extended abstract is of good quality, and it fully reflects the core of the doctoral thesis. Moreover, it properly reflects the contributions that the doctoral thesis has on polymer science and related applications.

4. Opinions, notes and recommendations

Notes:

1. On page 58 you use “broad peak” instead of “amorphous halo” in the X-ray diffraction pattern obtained with wide-angle X-ray scattering.

I have the following questions for the doctoral student:

1. When synthesizing the TiP catalyst, you used a 1:5 molar ratio between titanium (IV) chloride and triethyl phosphate TEP (scheme 4). Is there a reason for using this exact molar ratio, i.e. is it the result of optimization or did you have preliminary data on its appropriateness?

2. In Figure 9, Tables 5 and 6, the yield of VNET obtained by microwave heating is systematically lower than that obtained by conventional heating. Do you have an explanation?

All these questions arise from the interesting topic and the significance of the results obtained, both for polymer science and for practice.

4. Conclusion

According to the grounds of the documentation presented by the candidate, on his/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/DSc on Simona Zahova.

Date:

12.02.2025

Reviewer:

Member of the Academic Jury