

OPINION

by Prof. Dr. Denitsa Yancheva Pantaleeva,

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for a dissertation for the award of the educational and scientific degree of “Doctor”

in the field of higher education – 4. Natural Sciences, Mathematics, and Computer Science;
professional field – 4.2. Chemical Sciences; doctoral program “Organic Chemistry.”

Author: *Maria Valentinova Bachvarova*

Topic: “*Synthetic Transformations of 2-Aryl Thiazole and Benzothiazole Compounds*”

Scientific supervisor: Assoc. Prof. Dr. Stella Statkova-Abeghe (Paisii Hilendarski University of Plovdiv, Faculty of Chemistry, Department of Organic Chemistry)

1. General Overview of the Procedure and the Doctoral Candidate

The author of the presented dissertation, “Synthetic Transformations of 2-Aryl Thiazole and Benzothiazole Compounds,” submitted for the award of the educational and scientific degree of “Doctor” in the field of higher education 4. Natural Sciences, Mathematics, and Informatics, professional field 4.2. Chemical Sciences, doctoral program “Organic Chemistry,” is Maria Valentinova Bachvarova, a full-time doctoral student under the supervision of Assoc. Prof. Dr. Stella Statkova-Abeghe (Paisii Hilendarski University of Plovdiv, Faculty of Chemistry, Department of Organic Chemistry). The set of materials submitted by the doctoral student complies with the Regulations on the Development of the Academic Staff at Plovdiv University and includes the following documents:

- request to the Rector of Plovdiv University to initiate the dissertation defense procedure;
- curriculum vitae in European format;
- list of project participation;
- dissertation;
- dissertation summary in Bulgarian and English;
- declaration of originality and authenticity of the attached documents;

- list of scholarly publications related to the dissertation topic;
- copies of the scholarly publications (2 copies);
- statement confirming fulfillment of the minimum national requirements for the award of the “Doctor” degree.

2. Relevance of the Topic

The synthetic transformations of heterocyclic compounds to yield biologically active compounds is undoubtedly a topical field of research. In this light, the development of direct and efficient approaches to functionalization—including the introduction of substituents at heteroatoms, in aromatic rings, or the formation of new functional groups—is particularly valuable.

3. Knowledge of the Topic

Ph.D. candidate M. Bachvarova demonstrates a profound knowledge of the topic, as evidenced by her well-organized and detailed literature review, as well as by the formulation of specific research tasks that lead to clear results and conclusions.

4. Research Methodology

Modern synthetic approaches were used, applying and building upon the methodologies developed by the research group, along with a wide range of instrumental techniques for characterizing the structure of the compounds. The data have been presented and analyzed in detail by the doctoral candidate, demonstrating that she has successfully mastered their application for the purposes of the research.

5. Characteristics and Evaluation of the Dissertation

The dissertation comprises 146 pages, and the material is illustrated with 11 tables, 43 figures, and 92 schemes. The structure of the dissertation is as follows: Introduction – 1 page; Literature Review – 51 pages; Results and Discussion, including the aim and research tasks of the dissertation – 24 pages; Experimental Section – 34 pages; Summary of Results and Conclusions – 1 page; Appendices – 4 pages; Declaration – 1 page; References – 26 pages, including 264 references.

The literature review on the dissertation’s topic is comprehensive and draws on both the foundational works in the field and a significant number of more recent publications. The aim of the study is clearly formulated, and the research tasks set out reliably outline the steps necessary to achieve it. The main focus of the dissertation is the chapter “Results and Discussion.” It presents, in a series of subsections, the results obtained regarding the amidoalkylation of ferrocene with *N*-acyl-magnesium reagents derived from benzothiazole and alkyl chloroformates; the preparation of precursors for the synthesis of *N*-methylcamalexin and oxy-camalexins; the oxidative transformations of *N*-acyl-2-(1-

ferrocenyl)-benzothiazolines and 2-indolyl thiazolines; and the formation of an aldehyde group through reductive transformations of *N*-Troc-2-(3-indolyl)-thiazolines and 1,3-bis(2,2,2-trichloroethoxycarbonyl)-2-phenyl imidazolines. The synthetic reactions carried out, the optimization of the reaction conditions, and the structural characterization of the products are discussed in detail and illustrated with figures and schemes. The experimental section describes the synthetic procedures and the characterization of the compounds. The dissertation concludes with general conclusions regarding the applicability of the investigated conditions for α -amidoalkylation, oxidative and reductive transformations, the products obtained (43 compounds, 28 of which are new and unreported in the literature), and conditions for purification and isolation. The nature and reliability of the data on which the conclusions are based are beyond doubt.

6. Evaluation of the Doctoral Student's Publications and Personal Contributions

Ph.D. candidate M. Bachvarova has presented two publications on the topic of her dissertation. The articles have been published as open access in prestigious journals ranked in the highest quartiles—Q1 (*Molecules*) and Q2 (*Journal of Organometallic Chemistry*). To date, one independent citation has been identified for the second publication. The total number of points these publications contribute is 45, which meets and exceeds the requirement of 30 points under Criterion group 4, according to the minimum national requirements.

The dissertation and the work carried out for it are the doctoral candidate's own work, as evidenced by M. Bachvarova's leading roles in the author teams of both publications and the numerous presentations she has delivered to the scientific community. There is no evidence of dishonest use of others' unpublished or published results, ideas, etc. I have not found any instances of plagiarism in the dissertation submitted to me for review.

7. Summery

The summery is 31 pages long and primarily covers the "Results and Discussion" section of the dissertation, along with a brief introduction, a presentation of the study's aim and research tasks, the conclusions, and a short bibliography. The abstract is written concisely and clearly and accurately reflects the main results achieved in the dissertation.

8. Recommendations for the Future Use of the Dissertation's Contributions and Results

The contributions presented in the dissertation are original and stem directly from the fulfillment of the research aim and tasks. The synthetic conditions developed could be applied as a direct approach for the preparation of substituted aza-heterocyclic compounds, with or without *N*-acyl moieties in the final structure.

CONCLUSION

The dissertation contains scientific and practical results that represent an original contribution to science and meet all the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Implementation of the LDASRB, and the relevant Regulations of Paisii Hilendarski University of Plovdiv. The materials and results presented fully comply with the specific requirements of the Regulations of the Faculty of Chemistry at Plovdiv University for the Implementation of the LDASRB.

Based on the dissertation submitted, it can be confidently concluded that Maria Valentinova Bachvarova has acquired in-depth theoretical and practical knowledge in line with the focus of the “Organic Chemistry” doctoral program, and that during the course of her studies she has developed the necessary skills to conduct independent scientific research.

For this reason, I express my positive assessment of the research conducted, the results achieved, and the contributions made, and ***I propose that the Academic Jury award the academic and scientific degree of “Doctor” to Maria Valentinova Bachvarova*** in the field of higher education – 4. Natural Sciences, Mathematics, and Computer Science, professional field – 4.2. Chemical Sciences, doctoral program “*Organic Chemistry*”.

16.06.2026.

Prepared the opinion:

(Prof. Dr. Denitsa Pantaleeva)