

OPINION

by Prof. Svetlana Simova, DSc., retired.

of a doctor thesis for awarding the educational and scientific degree "doctor" in the field of higher education 4. Natural sciences, mathematics and informatics, professional direction 4.2. Chemical sciences, PhD program "Organic Chemistry"

Author: Maya Trifonova Tavlinova-Kirilova

Topic: "Chiral aminobenzyl-naphthols and -quinolinols, and dihydro-1,3-naphthoxazines - synthesis and catalytic applications"

Scientific supervisors: Assoc. Prof. Dr. Kalina Kostova and Assist. Prof. Dr. Mariana Kamenova-Nacheva, IOCCP-BAS

1. General description of the procedure and the doctoral student

The author of the dissertation is Maya Trifonova Tavlinova-Kirilova - doctoral student of independent training at the OSS laboratory - IOCCP with scientific supervisors Assoc. Prof. Dr. Kalina Kostova and Assist. Prof. Dr. Mariana Kamenova-Nacheva from IOCCP-BAS

The set of materials presented by Maya Tavlinova in paper and electronic media is in accordance with the Regulations for the Development of the Academic Staff of the IOCCP and meets the criteria of the IOCCP -BAS for the acquisition of the scientific and educational degree "doctor".

The PhD student has attached 3 publications, with 2 citations noticed so far. Participation in 7 scientific conferences in the country and abroad, mainly with poster presentations, as well as significant participation characteristic of the OSS laboratory in 24 scientific and scientific-applied projects are described. The materials are clear and informative, allowing easy orientation in them.

2. Relevance of the topic

The topic is in a topical direction for organic chemistry. Research in recent years has shown that multicomponent reactions are a modern tool for fast, easy, and efficient preparation of structurally diverse multifunctional compounds such as new drug candidates, intermediates, catalysts, and others. Especially in asymmetric synthesis and catalysis, efforts are being made to develop synthetic strategies of new chiral ligands that are suitable for diverse applications.

3. Knowledge of the problem

The doctoral student is well acquainted with the subject of the dissertation, which is reflected in the literature review, which occupies a significant part of the dissertation, describing what is known about the reactions used in the dissertation. A detailed literature analysis is also

presented for enantioselective addition of diethylzinc to aldehydes catalysed by chiral aminobenzyl-naphthols.

4. Research methodology

Based on the knowledge of preparation and properties of the reactions and reagents used, conditions were found for the preparation of several complex chiral compounds with different isomeric forms. Their chemical structure and properties in solution under different conditions and in the solid phase have been deduced and confirmed with a wide range of methods - chromatographic and spectral, angle of rotation, X-ray structural analysis and others. The newly synthesized compounds were applied as catalysts in the enantioselective addition of diethylzinc to aldehydes. The antimicrobial and antiviral activity of a set of the synthesized products was evaluated. The methods used are modern, adequate to achieve the set goals and competently performed, and it should be noted that the experimental work was performed very precisely and with attention to many details.

5. Characterization and evaluation of the dissertation work and contributions

The material in the dissertation is arranged according to the classical scheme. After the introduction, the goals and objectives are listed. The literature review is very detailed. The experimental part describes in detail the experiments performed. The most essential part of the dissertation work is the "Results and Discussion" part. It discusses in detail the successful and unsuccessful attempts to synthesize the target compounds, the conditions for their preparation, the differences in their properties, applying the necessary methods to prove their structure and the investigated substances and mixtures are characterized in detail. The experimental part describes in detail the apparatus, reagents and methods used, as well as the reliable characterization of the new compounds. The experimental results and the described discussions are correctly presented, do not cause doubt, and represent an adequate description of the conducted research.

The main contributions of the dissertation are scientific and scientific-applied. They can be characterized as new to science and as an extension of existing knowledge. They represent a valuable contribution to the knowledge of the synthesis of new chiral non-racemic reagents with diverse applications. The following more important contributions can be noted:

- Several interesting new compounds were synthesized by means of *Mannich* condensations and three-component *Betti* type condensations, and in many cases very good yields, high diastereoselectivity and good catalytic properties - enantioselectivity up to 98% ee were achieved.

- Isolated are intermediates and final products derived from diketopiperazine, which are promising in future developments for the synthesis of structurally diverse multifunctional compounds with potential biological activity.

- All the newly synthesized compounds are fully characterized by NMR spectroscopy, mass spectrometry and elemental analysis, and the chiral ones with a specific angle of rotation.

6. Evaluation of the publications and personal contribution of the doctoral student

Publications meet the requirements for a self-study dissertation, all in journals indexed in Web of Science and/or Scopus open access (one in Q2 and two in Q4). Some of the results of the dissertation were also presented at seven scientific forums. It should be noted that the doctoral student has carried out considerable experimental work, presented the obtained results correctly and commented on them competently. She has mastered the necessary skills for modern work with chiral compounds - various methods for synthesis and analysis. This convincingly shows that the educational goal of the dissertation work has also been successfully fulfilled. I am convinced that the contributions to the work are mainly hers personally, of course with the necessary support and guidance from her scientific supervisors.

7. Abstract

The abstract correctly and comprehensively reflects the content of the dissertation work, and I accept it without remarks on the substance.

8. Recommendations for future use of dissertation contributions and results

The dissertation is in the traditional topic of Prof. Vladimir Dimitrov's group - asymmetric catalysis, and I am convinced that the research in the current dissertation will help colleagues in the group to reach generalizing results in future research as well.

CONCLUSION

The dissertation contains scientific, scientific-applied, and applied results, which represent an original contribution to science and meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the Implementation of the ZRASRB and the Regulations for the Implementation of ZRASRB of the BAS. Submitted materials and dissertation results in full correspond to the specific requirements of the Regulations of IOCCP-BAS for the application of ZRASRB.

The dissertation work shows that the doctoral student Maya Tavlinova possesses in-depth theoretical knowledge and professional skills in the scientific specialty "Organic Chemistry" by demonstrating qualities and skills for independent conduct of scientific research.

Due to the above, I confidently give my positive assessment of the conducted research, presented by the above-reviewed dissertation work, abstract, achieved results and

contributions, and I propose to the honourable scientific jury to award the educational and scientific degree "doctor" to

Maya Trifonova Tavlinova-Kirilova

in the field of higher education: 4. Natural sciences, mathematics and informatics, professional direction 4.2. Chemical sciences, doctoral program "Organic Chemistry"

08.03.2024

Prepared the opinion:

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(Prof. Svetlana Simova, DSc.)