REPORT

of dissertation for the acquisition of the educational and scientific degree "Doctor"
in the field of higher education 4. Natural Sciences, Mathematics and Informatics
professional field 4.2. Chemical Sciences
doctoral program "Organic Chemistry"

by Professor Vladimir Bojinov Bojinov, DSc – UCTM

Author of the dissertation: ***Irena Bocheva Zagranyarska***
Topic: ***Stereoselective synthesis of functionalized chital amino alcohols – configuration and application***
Scientific advisers:
1) Assoc. Prof. Kalina Kostova, Dr. – IOCCP-BAS
2) Prof. Vladimir Dimitrov, DSc – IOCCP-BAS

1. General presentation of the procedure and the doctoral candidate

Irena Zagranyarska graduated as a chemist at the Bachelor's Degree in 2005 and in 2007 as a chemist at the Master's Degree at the Faculty of Chemistry of Sofia University "St. Kliment Ohridsky". In 2005, she was appointed as a chemist, and from 2008 occupied the academic position "assistant" at the Institute of Organic Chemistry with Centre of Phytochemistry - BAS.

The documents presented by Assistant Professor Irena Zagranyarska on electronic media are in accordance with the Regulations for the development of the academic staff of IOCCP-BAS and meet the requirements published on the website of the institute and the necessary documents for obtaining the educational and scientific degree "Doctor", except Information on a sample for fulfilment of the criteria of IOCCP-BAS (item 12 of Necessary documents for acquiring the educational and scientific degree "Doctor").

The two articles presented in connection with the dissertation, published in the journals *Bulgarian Chemical Communications* and *Molecular Diversity*, cover the criteria of IOCCP-BAS for obtaining the educational and scientific degree "Doctor".

There is also a list of participation in 14 scientific forums, a list of participation in 16 national and international research projects, contracts and programs, documents for citations and awards.

2. The relevance of the topic of the dissertation

Amino alcohols are an important class of compounds that find application in the preparation of a number of multifunctional products, including drugs, also as industrial chiral catalysts in enantioselective addition reactions. In this context, the development of new synthetic approaches for the preparation of enantiomerically pure amino alcohols and the study of their configuration and possibilities for their application as ligands for the asymmetric addition of diethylzinc to various aromatic aldehydes remains relevant.

3. Knowledge of the problem

The review of the literature corresponds directly to the objectives of the dissertation and clearly demonstrates the high competence of Assistant Professor Zagranyarska in the field of subject matter. Two hundred and three sources are cited, but surprisingly, only eight of them have been published in the last 5 years.

4. Research methodology

The obtained excellent results are in full accordance with the set tasks, which demonstrates a high degree of creative approach in the selection of research methodology for achieving the goals of the dissertation.

5. Characteristics and evaluation of the dissertation and scientific contributions

The dissertation, whose philosophy is based on the creation of a synthetic methodology for obtaining new compounds and their application, is structured correctly by including all the necessary components, including evidence on the results achieved.

The scientific contributions of the dissertation should be related to the synthesis of new chiral non-racemic amino alcohols and sulfur analogues with a menthane skeleton, steroid analogues of 2-naphthol – isoequilenine and desoxy-isoequilenine, chiral as well as non-racemic aminomethylnaphtols and their configuration was proved by NMR techniques. The new compounds were prepared by stereoselective addition of functionalized organolithium reagents to (–)-menthone, selective transformation of estrone and diastereoselective three-component Betty condensation of desoxy-isoequileneine, various aromatic aldehydes and chiral amines, respectively.

The synthesized compounds are fully characterized and proven using the most modern methods of analysis, incl. elemental analysis, mass spectrometry, NMR spectroscopy in its varieties, X-ray diffraction analysis.

All new synthesized compounds were used in catalytic amounts as chiral ligands to effect the enantioselective addition of diethylzinc to various aldehydes. High yields of the coupling products and enantioselectivity up to 98% *ee* were achieved.

6. Assessment of the doctoral candidate's publications and personal contribution

The scientific results in the dissertation of Assistant Professor Irena Zagranyarska are formed in two scientific articles published in journals with impact factor (*Bulgarian Chemical Communications* 2017 and *Molecular Diversity* 2019). The older publication in *Bulgarian Chemical Communications* was cited once in a publication in the journal *Ekoloji*. Some of the results of the dissertation were promoted at a total of 14 scientific conferences with poster presentations and one oral presentation. From the presented list it becomes clear that seven of the participations are in international conferences, six of which in scientific forums abroad - Switzerland, France, Slovakia, Northern Macedonia. The scientific works of Assistant Professor Zagranyarska are collective. She is the first author in both publications, which shows the significant contribution of the doctoral candidate in the presented works.

It would be better if copies of the abstracts of poster reports were presented, which would facilitate assessment concerning the promotion of the results of the thesis.

7. Abstract of Doctoral Dissertation

The Abstract of Doctoral Dissertation correctly reflects the main results achieved in the thesis.

CONCLUSION

The dissertation ***contains scientific and scientific-applied results, which represent an original contribution to the scienc***e and meet the requirements of the Law for Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for application of LDASRB and the Regulations for application of LDASRB of Bulgarian Academy of Sciences (BAS). The presented materials and dissertation results fully comply with the specific requirements of the Regulations of IOCCP-BAS for application of LDASRB.

The dissertation and the results obtained show that the doctoral candidate Irena Zagranyarska has in-depth theoretical knowledge and professional skills in the scientific specialty 4.2. Chemical Sciences (Organic Chemistry) by demonstrating the qualities and skills to conduct research independently.

In connection with the above, taking into account the considerable amount of experimental activities, scientific and applied contributions as well as the achievement of the educational objectives of the dissertation, I confidently give a ***positive assessment*** of the dissertation and ***invite the respected scientific jury to confer the educational and scientific degree "Doctor"*** on Irena Bocheva Zagranyarska in the field of higher education: 4. Natural Sciences, Mathematics and Informatics, professional field 4.2. Chemical Sciences, doctoral program of "Organic Chemistry".

20.08.2020 г. **The report was written by**: .....

Prof. Vladimir Bojinov, DSc