

Review

of prof. Denitsa Yancheva Pantaleeva, PhD,

Institute of Organic Chemistry with Centre of Phytochemistry, Bulgarian Academy of Sciences,
Laboratory of Structural Organic Analysis,
member of the scientific jury appointed with administrative act № УД-304/28.11.2019 г. of the
Rector of Burgas University "Asen Zlatarov"

regarding: The quality of doctoral thesis of Victoria Trifonova, assistant professor at the
Biotechnology Department of the Faculty of technical Sciences, Burgas University "Asen
Zlatarov"

1. Topicality of the research area

The doctoral thesis of assistant professor Victoria Trifonova is focused on the synthesis, characterization and study on the catalytic properties of polymermetal complexes based on polyethyleneglycol, amino acids, and oligopeptides. The structure and electronic properties of all synthesized complexes were studied extensively by means of experimental and theoretical methods. In order to outline the possible areas of application, the catalytic properties of the polymermetal complexes were elucidated in the oxidation of cyclohexene with tert-butylhydroperoxide in aerobic conditions.

Having in mind the importance of the catalytic oxidation of alkenes with organic hydroperoxides as industrial process for epoxides preparation and the constant need for development of new catalysts with improved efficiency, the study presents significant novelty and scientific merit.

2. Evaluation of the PhD dissertation and scientific contributions

The doctoral thesis covers 136 pages, with content separated in the following chapters: Introduction, Literature review, Aim and tasks, Experimental section, Results and discussion, Conclusions, Scientific contributions and References. The references include 163 scientific articles and books. The doctoral thesis is illustrated by 39 figures, 7 schemes and 23 tables. The summery booklet reflects the content, conclusions and scientific contributions of the doctoral thesis in a detailed and coincide way.

The Literature review presents in details the different dendrimer and peptide molecules, their metal complexes, the synthetic approaches for their preparation and different characterization methods, along with the mechanisms of catalytic alkene oxidation with organic hydroperoxides. The references cited in the Literature review, encompass a large number of scientific studies, including articles published in the recent years, which is a good evidence for the topicality of the research area on one side, and the good knowledge of the field acquired by the doctoral candidate on the other side. A concluding summary with the most important aspects is provided in the end of the Literature review, which had to my opinion contributed significantly to the clear and correct definition of the doctoral study aim and the tasks for its completion.

With defined aim and tasks, the doctoral candidate has focused her efforts in the synthesis of three groups of complexes: complexes of Mo(VI) with unmodified and modified dendrimers; metal complexes of the amino acids lysine, methionine, and phenylalanine; metal complexes of the dipeptide glycylglycine and the tripeptide glutathione. The characterization of the prepared complexes was carried out by application of combined experimental spectral and analytical techniques (IR, TGA, ESR, elemental analysis) and quantum-chemistry computations, which allowed successful elucidation of the complexes structure and a series of electronic parameters. The conducted study on the catalytic activity has demonstrated a significant selectivity of the prepared complexes resulting in favored generation of cyclohexene oxide in the oxidation of cyclohexene with tert-butylhydroperoxide. The catalytic study has also provided important structure-activity relationships for the complexes and their selectivity.

The obtained data are presented in a systematic way, supported by relevant tables and graphical materials that facilitate considerably the review of the doctoral thesis results. The provided discussion is detailed, comprehensive and written in a good scientific style.

3. Publications on the doctoral thesis

The studies presented in the doctoral thesis are published in 5 scientific articles – two in journals with impact factor; one – in a journal indexed in the world scientific databases, and two – in peer-review journals not indexed in the world scientific databases. The scientific results are presented at 4 conferences. In most of the published articles and conference presentations, Victoria Trifonova is a leading author, which testify her main role in the conducted studies.

4. Critical comments and recommendations

Having in mind the topicality of the research area and the promising results obtained within the doctoral studies, I recommend to the doctoral candidate to develop further the structure elucidation of the complexes of lysine, methionine, phenylalanine, and glutathione by

implementing the density functional theory methods as it was done for the rest of the studied polymermetal complexes.

CONCLUSION

The doctoral thesis of Victoria Trifonova contains scientific and practical results that provide original contribution to the science and fulfill all requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for Implementation of the ZRASRB and the relevant Regulations of Burgas University "Asen Zlatarov". The presented material and results fulfill the specific requirements for granting the educational and scientific degree "doctor" in the field of complexes of high-molecular compounds.

In consideration of the above-mentioned, I give my positive evaluation to the doctoral thesis and recommend to the Scientific Jury to grant the educational and scientific degree "doctor" to Victoria Trifonova in the field of higher education: "Technical sciences", professional classification 5.10. "Chemical Technologies", scientific specialty "Chemistry of high-molecular compounds".

Sofia, 10.02.2020 г.

Reviewer:

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/ prof. Denitsa Pantaleeva, PhD /