

Report

from Assoc. Prof. Dr. Eng. Desislava Staneva Grabcheva,
University of Chemical Technology and Metallurgy, Sofia, Bulgaria
member of the scientific jury appointed with administrative act № УД – 304/28.11.2019,
from Rector of University "Prof. Dr. Assen Zlatarov" - Burgas, Prof. Dr. Magdalena Mitkova

for the dissertation thesis presented by Victoria Trifonova Trifonova, with topic: PREPARATION, CHARACTERIZATION AND APPLICATION OF POLYMERMETAL COMPLEXES", for the award of the educational and scientific degree 'Doctor', scientific area 5. Technical Sciences, professional area 5.10. Chemical Technologies, Scientific specialty Chemistry of high-molecular compounds

Supervisors: prof. Dr. Krasimir Vasilev and assoc. prof. Dr. Anife Achmedova

1. Short biography of the PhD student

Victoria Trifonova Trifonova after completing her Master's Degree in "Chemistry and Teacher in Chemistry" at the University "Prof. Dr. Assen Zlatarov" - Burgas since 2003 started working first as a Laboratory Chemist and then as an assistant at the Department of Inorganic and Analytical Chemistry at the same University. In 2018 she was enrolled as a PhD student on a self-study basis in the scientific specialty "Chemistry of high-molecular compounds" at the University "Prof. Dr. Assen Zlatarov", Burgas.

2. Topicality of the thesis

Metal complexes of branched polymer or biomolecules have interesting properties that can find a variety of applications. This determines the increased interest of specialists in various fields - chemists, theorists, biologists and technologists, to clarify the exact mechanisms of their catalytic action, with a view to their application for technological purposes.

Therefore, the topic of the dissertation research is relevant as it aims to obtain and characterize new metal complexes with polydentate ligands with a view to their application for the selective oxidation of alkenes with organic hydroperoxides. In addition, the experimental data obtained is compared

with the theoretical studies of the structural (geometric and electronic) characteristics of the complexes. On this basis, assumptions are made about the likely mechanisms of the catalytic process under study.

3. Evaluation of the dissertation contributions

The dissertation contains 136 pages, 39 figures, 23 tables and 7 diagrams. The bibliography includes 163 titles. The appendixes include 3 figures and 6 tables.

Following a thorough literature review, and in pursuit of the stated objective, several complexes with dendrimer molecules, as well as with some amino acids and oligopeptides with different metal ions have been synthesized. They are characterized by various spectral and analytical methods (IR, TGA, EPR and elemental analysis).

Applying quantum-chemical methods, the electronic and spatial structure of the ligands and the resulting complexes have been investigated to determine the correlation of their composition and catalytic activity. The resulting complexes have been then used as catalysts in the reaction of cyclohexene oxidation with tert-butyl hydroperoxide under aerobic conditions for which no literature data has been found. A gas chromatographic method with mass spectral detection has been used to identify the products of the reaction. The used polymermetallic catalysts have been found to exhibit considerable selectivity to advantageously yield cyclohexene oxide. However, as the molecular weight of the polymer carrier increases, the selective catalytic action of the complexes diminishes.

In this way, the dissertation skillfully combines experimental data with theoretical calculations and makes its scientifically applied contribution in the field of production and application of metal complexes with organic ligands and their potential applications in catalysis and biomedicine.

4. Dissemination of the results

The results of the dissertation are published in five papers, three of which are referenced and indexed in world-famous scientific information databased (*Journal of Biomaterials and Nanobiotechnology*, *Bulgarian Chemical Communications*, *Oxidation communications*). The PhD student is the first author in three of the papers. The results of the dissertation are presented at four conferences. In the presented documents by PhD student Victoria Trifonova there is not data for the

citation on the papers, but the reference I have made, showed that the article published in the *Journal of Biomaterials and Nanobiotechnology* had already received a good response among the scientific community and was cited so far 8 times.

5. Remarks and recommendations

Although, the Rules for the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at the University “Prof. Dr. Assen Zlatarov ”- Burgas does not require this from the PhD students, it would be better to present the Report for the fulfillment of the mandatory minimum national requirements to the members of the scientific jury.

Conclusion

The presented dissertation contains scientific and applied results related to the production, research and application of metal complexes with organic ligands and comply fully and even exceeds the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Implementation of the LDASRB and the relevant Regulations of the University “Prof. Dr. Assen Zlatarov” – Burgas. Therefore, I give my positive assessment of the research and the results obtained in the dissertation and propose to the scientific jury to award the educational and scientific degree "Doctor" of Victoria Trifonova Trifonova in the scientific area 5 Technical Sciences, professional field 5.10 Chemical Technologies, scientific specialty Chemistry of high-molecular compounds.

Подпис заличен
Чл.2 от ЗЗЛД

February 6, 2020

assoc. prof. eng. Desislava Grabcheva