

OPINION

from prof. Konstantin Ivanov Hadjiivanov

Institute of General and Inorganic Chemistry - Bulgarian Academy of Sciences

on a thesis for awarding the scientific degree "**Doctor of Science**"

in a Professional Direction - 4.2. *Chemical Sciences*,

Scientific Specialty *Organic Chemistry*

Author: Professor Dr. Margarita Dimitrova Popova - Institute of Organic Chemistry with Centre of Phytochemistry - Bulgarian Academy of Sciences.

Topic: Novel Approaches in the Preparation of Nanoporous Materials with Application as Catalysts and Drug Carriers.

1. General presentation of the procedure and the thesis

Margarita Popova is a professor at the Institute of Organic Chemistry with Centre of Phytochemistry at the Bulgarian Academy of Sciences, where she began her scientific career as a PhD student. She is an internationally recognized scientist. According to the Scopus database, Popova is the author and co-author of 94 scientific papers, on which over 1450 independent citations have been noted. Her H-index is 22.

For the defense of the thesis for awarding the scientific degree Doctor of Sciences Prof. Popova has presented a set of documents, incl. the required by law, namely: (i) Application for admission to the defense, (i) Thesis, (ii) Abstract (iii) PhD diploma, (iv) scientific CV, (vi) copies of the scientific papers included in the thesis, as well as other relevant applications.

2. Relevance of the topic and knowledge of the problem

The topic of the thesis is related to porous materials, and two of their applications have been developed - in ecological catalysis and as drug carriers. Both applications are important and are associated with improving the quality of life.

Dr. Popova demonstrates a very good knowledge of the scientific literature in the fields related to her thesis. The referenced literature reflects the main key articles on the issues.

3. Characteristics and evaluation of the thesis and contributions

Prof. Popova's thesis is written in English on 215 non-standard pages. Research has been conducted at a high scientific level, mainly in Bulgaria and Hungary. Popova's works are dedicated to the development of effective catalysts or drug carriers. As a rule, they include synthesis of materials, detailed physicochemical characterization and research related to the

application. Modern physicochemical methods such as NMR, IR spectroscopy (including adsorbed molecules), UV-Vis spectroscopy, X-ray phase analysis, transmission electron microscopy, AFM, ESR, thermoprogrammed oxidation and reduction, Mössbauer spectroscopy, adsorption measurements, in vitro studies of drug release, etc. were used for the materials' characterisation.

The first part of the thesis describes the development of catalysts for full oxidation of volatile organic compounds (VOCs). Porous materials (mainly MCM-41 and SBA-15) modified with a wide range of transition metal cations have been studied. Both the composition and the synthesis methods have been optimized, which has led to the synthesis of highly active catalysts for full oxidation.

The second part is dedicated to the development of materials as drug carriers. In this case, an approach was used to modify the porous materials with different functional groups and the range of supports was expanded to include not only mesoporous structures but also zeolites. I will not dwell in more detail on the specific scientific contributions, as they are very well summarized by the candidate.

4. Abstract

The abstract of the thesis is presented in two copies - in English and in Bulgarian. The Bulgarian version covers 107 non-standard typewritten pages. The abstract adequately and completely, even in too much detail, reflects the results of the thesis.

There is no overlap between the current work and the PhD thesis. The PhD diploma is from 1998, and the earliest work included in the presented thesis is from 2008.

5. Scientometric indicators

The scientific publications included in the thesis are 28 in total and represent less than 1/3 of the total number of scientific papers of the applicant. All articles have been published in journals with IF, with 27 of them in journals of the highest category Q1. One of the articles is in the journal Applied Physics A, which in the year of its publication moved to category Q2, but was in category Q1 when the article was submitted. This shows that Dr. Popova is not looking for quantitative indicators, but pays special attention to the reputation of the journals in which she publishes.

Most articles (8 in total) have been published in Microporous and Mesoporous Materials. Two/three articles have been published in ChemCatChem, Journal of Hazardous Materials and Journal of Solid State Chemistry. Of the other journals, I would highlight Applied Catalysis B with an IF of 16.68.

A large part of the works (23 in total) is in collaboration with Hungarian colleagues. The analysis of their scientific indicators shows that they are not the leading scientists in the research, but rather an equal and effective collaboration was realized.

The average number of co-authors in the presented papers is 5.6, which is normal for the scientific field. It is essential that in 18 of the publications Popova is a corresponding author, which emphasizes her leading role in the research.

The total number of points received from the articles significantly exceeds the required minimum, accepted by the Institute of Organic Chemistry for obtaining the scientific degree of Doctor of Sciences. The indicators definitely exceed many times the national criteria.

A list of 37 participations in scientific forums, reflecting the results of the thesis, is also presented.

Dr. Popova presented a list of 678 independent citations (all included in the Scopus database) on the scientific papers included in the thesis. This significantly exceeds the minimal requirements both at the national level and of the Institute. I have personal impressions of the positive nature of many of the citations. Some of Popova's works can now be qualified as classic in the respective field.

6. Remarks and recommendations

I have no significant remarks on the thesis. In my opinion, the abstract is too long and could reflect the thesis in a more concise form.

CONCLUSION

The scientific results summarized in the thesis represent a significant and original contribution to science and are highly appreciated by the international scientific community.

Based on the above, I confidently give my positive assessment of the thesis, and I propose to the esteemed scientific jury to award the degree of Doctor of Sciences to Professor Dr. Margarita Dimitrova Popova in the Professional field 4.2. *Chemical Sciences*, Scientific Specialty *Organic Chemistry*.

10.09.2021

Prof. K. Hadjiivanov