

To the Chairman of the Scientific Jury
to the Faculty of Social Sciences
of the "Prof. Dr. Asen Zlatarov" University, Burgas

REVIEW

According to a competition for the occupation of an academic position "Associate professor", in the field of higher education 5. Technical sciences, professional direction 5.13. General engineering, scientific specialty 02.10.23 "Technology of natural and synthetic fuels", with only one candidate head assistant Dr. Milena Petkova Dimitrova

Reviewer: Prof. Dr. Magdalena Sabeva Mitkova

1. Brief biographical data and description of the candidate's scientific interests.

Head Assistant Milena Petkova Dimitrova, PhD, was born in the city of Burgas. He completed his secondary education at the Technical School of Industrial Chemistry "Acad. N. D. Zelinsky" - Burgas. He received his higher education at the University «Prof. Dr. Asen Zlatarov», Burgas. He completed two master's degrees: Master in "Oil, Gas and Chemotology Technology", chemical engineer and Master in "Oil, Gas and Chemotology Technology" with a pedagogy profile, chemical engineer - chemistry teacher. There is a protected disertation on the topic "Regulations in obtaining fuel additives based on petroleum hydrocarbons", certificate No. 32462 from the State Audit Office dated 23.06.2008, Sofia, district of higher education 5. Technical sciences, scientific specialty code 02.10.23 "Technology of natural and synthetic fuels". The candidate's scientific interests are mainly related to the study of contamination of technological equipment in oil refining installations as a result of the use of various raw materials and the specificity of corrosion processes, as well as the reduction of corrosion processes in installations for atmospheric distillation of oil and the introduction of inhibitory protection in installations for bitumen production. Research has been conducted related to studies on chemical treatment of various oil fractions to reduce and remove sulfur compounds through alternative purification methods.

2. General characteristics of the candidate's scientific-research, scientific-applied and teaching activities.

The candidate's research activity is presented in the following publications:

- Independent monograph on the topic: Side processes causing contamination of technological equipment in oil refining installations
- Scientific publications in publications that are referenced and indexed in world-famous databases with scientific information (Scopus; Web of Science) - 12 issues (in English), of which 5 are independent, 2 articles as

first author, 1 article as second author , 3 articles as third author and 1 article as sixth author.

- Scientific publications in non-refereed journals with scientific review or in edited collective volumes - 7 publications in full text, of which: 3 independent and 4 co-authored, 2 in English.

Citations: 22 citations were noticed on the publications, which are neatly attached in the reference, h-index = 3.

Participation in competitions and scientific forums: Dr. Milena Dimitrova participated as the head of 1 (one) and as a team member of 3 (three) intra-university research projects.

- team leader in a research project under contract No. Contract No. NIH-468/2022 "Possibilities for purification of middle distillate fractions by an alternative method" at the Research Institute at the University "Prof. Dr. Asen Zlatarov" - Burgas, under the "NIHTD" fund of the university
- participation as a member of a team in a scientific research project under contract No. Contract No. NIH-471/2022 "Biological activity and phytochemical composition of extracts from the endemic plant *Sideritis syriaca*" at the Scientific Research Institute at the University "Prof. Dr. Asen Zlatarov" - Burgas, under the "NIHTD" fund of the university.
- participation as a member of a team in a research project under contract No. Contract No. NIH-438/2020 "Opportunities for obtaining gas oil component for tractor and off-road equipment" at the Scientific Research Institute at the University "Prof. Dr. Asen Zlatarov" - Burgas, under the "NIHTD" fund of the university
- For the period 2019/2023, she regularly participated in a scientific forum with international participation in the International Scientific Conference "Education, Science, Economy and Technology".

Teaching activity:

Head assistant Dr. Milena Dimitrova is the author and co-author in the development of more than 12 study programs, on which she leads lectures at the Bachelor's degree, the Master's degree and the PG. For the competition, she presented 12 study programs, in which 2 were authored and the remaining 10 were co-authored. Dr Milena Dimitrova, has published three university textbooks. She prepared 8 reviews of graduate theses of students from the Department of Industrial Management and was the supervisor of 1 graduate student.

3. Evaluation of the presented materials

Head assistant Milena Dimitrova, has submitted all the documents necessary for participation in the competition for the position of "associate professor". The materials are well designed and organized. The table shows the total number of points by groups

of indicators for the academic position of "associate professor" according to the requirements of the law and those presented by Dr Milena Dimitrova.

A group of indicators content	Associate Professor	Head Assist.Dr Milena Dimitrova
A. Indicator 1	50	50
B. Indicator 2		
B. Indicator 3 or 4	100	100
Г. Sum of indicators from 5 to 11	300	375,7
Д. Sum of indicators from 12 to 15	100	220
Е. Sum of indicators from 16 to 28	100	120
Amount	650	865,7

As can be seen from the table, compiled on the basis of the presented by Dr Milena Dimitrova data, she fulfills the necessary conditions for occupying the academic position "associate professor", exceeding the minimum requirements with 215.7 points.

4. Basic scientific and scientific-applied contributions

The main topic in the research of Dr. Milena Dimitrova is the analysis and study of the side processes that cause pollution of the technological equipment in the oil refining installations with the aim of developing good practices and improving the technological processes in oil refining, as well as in-depth studies on the influence of the raw material on the intensity of the flow of the side processes. To this problem, she devoted her habilitation thesis "Side processes causing contamination of technological equipment in oil refining installations", in which the factors and probable mechanisms for the formation of fouling for the relevant technological processes were examined. The damages they cause to the main process and the equipment are indicated, as well as the realized losses from the pollution. Methods for reducing or eliminating the various side processes are given. The monograph is written in Bulgarian in an academic style, well organized and at the same time readable for a wide audience of students and specialist chemists. It is of extreme importance for the development of the oil refining industry and especially for the protection, storage and proper operation of the installations in the oil refining industry.

In the last decade, serious attention has been paid to the quality of motor fuels. The European Union has created special norms related mainly to the protection of the environment and human health. In the publication of Dr Milena Dimitrova - Influence of feedstock for hydro-desulphurisation installations on the intensity of side processes, mainly emphasizes the influence of the processed raw material in installations for hydro-desulphurisation of diesel fractions on the behavior of ongoing unwanted side reactions accompanying the main process. It was concluded that the raw material should be subjected to a thorough analysis according to the standards before it is allowed for

processing, and the best protection of the plant against the occurrence of undesirable side processes is to avoid stockpiling the raw material, and if the supplied material is to be stored, this must be done in tanks under a nitrogen atmosphere to prevent autoxidation processes under the influence of environmental conditions. If it is impossible to use tanks, the addition of small amounts of antioxidants and antipolymerization agents should be planned. When accelerated corrosion processes are detected, inhibitory protection should be provided for the relevant units of the installation.

Three of the articles under indicator **Г.7.9., Г.7.10., Г.7.11** are devoted to the study of the specifics of corrosion processes for installations in oil processing complexes and their influence on the formation and growth of contamination on the surfaces of the equipment, implementation of methods for reduction of corrosion processes in installations for atmospheric distillation of oil and introduction of inhibitory protection in installations for the production of bitumen. In the publications, attention is focused on the selection of suitable products and methods for corrosion prevention in oil processing plants. The nature of the corrosive environment, its degree of activity in relation to the metal surfaces of the technological equipment and the methods for controlling the resulting processes of corrosion and pollution have been established. Most of the researches of Dr Milena Dimitrova, published in articles under the numbers: **Г.7.1., Г.8.1., Г.8.2., Г.8.6., Г.8.7., Г.7.8., Г.7.2., Г.7.3., Г.7.5., Г.7.7., Г.7.4., Г.7.6., Г.8.3., Г.8.4., Г.8.5., E.23.1., E.23.2., E.23.3.** are related to studies on the chemical treatment of various oil fractions for the reduction and removal of sulfur compounds through alternative purification methods and studies related to problems in the field of technical sciences and the professional direction "General Engineering".

Desulfurization of fuels has become a hot topic and has been of particular concern recently due to the increased environmental hazards that sulfur emissions have on the atmosphere, such as photochemical smog and acid rain. In the case of acid rain, sulfur gases mix with water vapor in clouds and condense with them as rain when the atmosphere in the cloud becomes saturated. The resulting acid rain can irreversibly damage ecosystems by disrupting groundwater pH and plant uptake. In study **Г.7.1**, the status of modern desulphurization methods in the petroleum industry was studied. HDS, ODS, absorption and BDS methods are discussed in detail. The advantages and disadvantages of each method are indicated, as well as alternative and promising ways that have been applied for decades. The application of various adsorption methods for the removal of sulfur compounds from gas oil are discussed in article **Г.8.1**. It has been established that adsorption methods can be applied as an alternative method for the purification of oil fractions from unlikely components.

The one described in article **Г.8.2.** experiment shows that by using the adsorption method on the prepared model systems, sulfur and arene hydrocarbons are removed, similar to the middle distillate fractions, which are similar in composition. Model equations describing the process of purification of middle-distillate components were derived from the obtained data. The presence of toluene in the ternary model mixtures was found to significantly reduce the desulfurization efficiency of the sorbents. In work

Г. 8.6, the thermodynamic characteristics of the oxidation processes in two gas oil fractions are considered. Oxidation processes are carried out to purify the used raw materials from sulfur compounds and arene hydrocarbons. The thermodynamic parameters of each of the processes were calculated: Gibbs energy, enthalpy and entropy of the individual systems, gas fraction: the oxidized mixture. It was found that for all the studied systems the oxidation process is thermodynamically possible. Publication **Г.8.7** examines the possibility of purifying middle distillate components from sulfur arene compounds until European requirements are met. This alternative method has been applied to clean off-road and tractor gas oil from unlikely compounds such as sulfur and arenes. For this purpose, an oxidation process was applied, as well as a combined laboratory process of oxidative-extraction purification with two polar solvents.

In the next publication **Г.7.8**, the possibility of improving the yield of middle distillate fractions by using additives of the type of pure arene concentrates and sulfur-arene concentrates is considered. Interesting results were obtained using benzyldimethyl(alkyl)ammonium chloride as an additive which, when added at 0.5%, initiated a 1.3% increase in the yield of the middle distillate fraction.

In article **Г.7.2**, the studies carried out for a possible replacement of the ACOR-10 series inhibitor widely used in practice in the production of working-preservative oils are described, and work **Г.7.3** reports on the synthesis of a complex oil-soluble inhibitor and the establishment of the optimal content of each individual component, without disturbing their stability in the solution and at the same time obtaining a maximum protective effect.

Interesting research **Г.7.5** was made on the coriander oil-ethanol-water system with a change in the % content of ethanol by measuring the parameters: density, surface tension, refractive index. The stability of emulsions prepared from an oil phase, an aqueous phase and different % of isolated soy protein for stabilization was investigated, as well as in **Г.7.7** where the emulsion stability of various corn O/W emulsions was investigated.

In publications **Г.7.4**, **Г.7.6**, the influence of addition of Ni on the eutectic temperature of the obtained ternary system Ni-Sn-Zn was traced. Two binary systems Ni-Sn and Ni-Ti were investigated by DTA analysis and extrapolated to a ternary system. Ternary compounds are described and defined with four sublattice models. The purpose of the present research is to present some results of thermodynamic calculations in a part of the ternary system unknown in the literature.

An assessment of the chemical risk during transportation by oil pipeline and storage of products from the oil refining industry, an analysis of modern and ecological trends in the collection, storage, safety and recycling of used ship oils during operation, transportation and berthing at ports in the Republic of Bulgaria was carried out. **Г.8.3**, **Г.8.4**. An analysis of basic tactical principles in criminal investigation, customs investigation and risk analysis was conducted. **Г.8.5**

E.23.1. A university textbook was published: Dimitrova M., "Customs investigation and risk analysis" in three parts for OCS "Master" students. My recommendation is that these three parts be enriched and published as a single textbook.

5. Reflection of scientific publications in Bulgarian and foreign literature.

There are 22 citations noticed on the proposed scientific publications, and the h-index is 3. Considering that a large part of the articles are from the last 3 years, it is expected that the number of cited articles will increase in the coming years.

6. Critical notes and recommendations

I have no critical remarks about the presented materials. I recommend Dr. Milena Dimitrova to strengthen the work with graduates.

7. Personal impressions of the reviewer

I know Dr Milena Petkova Dimitrova as an extremely hard-working researcher and conscientious teacher who strictly fulfills her work duties.

Conclusion:

The submitted materials for the competition for the academic position of "associate professor", in the field of higher education 5.Technical sciences, professional direction 5.13.General engineering, scientific specialty "Technology of natural and synthetic fuels", meet all the requirements of the law and the rules for its application. I believe Dr. Milena Petkova Dimitrova meets all the legal requirements, and I am fully convinced that I propose to the Scientific Jury under the present procedure to propose to the Faculty Council of the Faculty of Social Sciences to vote for the appointment of Dr. Milena Petkova Dimitrova to the academic position of "associate professor".

Reviewer:

Prof. Dr. Magdalena Mitkova

22.08.2023

Burgas