



REVIEW

by Assoc. Prof. PhD. Sibel Ilhanova Ahmedova

Scientific organization: Technical University – Varna

Faculty of Manufacturing Engineering and Tehnologies, Department of Industrial Management

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Regarding: Participation in 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", University "Prof. Dr. Asen Zlatarov" - Burgas, announced in the State Gazette, no. 42 of 12.05.2023 and on the University's website on 15.05.2023.

Candidate for the competitive academic position "Associate Professor": Ch. assistant Dr. Milena Petkova Dimitrova

Basis for the opinion: Order No. RD-182/27.06.2.23. of the Rector of the University "Prof. Dr. Asen Zlatarov" Burgas.

The review is in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LAD), the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LAD) and the Regulations for the Terms and Conditions for Acquiring Scientific Degrees and Holding Academic Degrees positions (PURPNSZAD) at University "Prof. Dr. Asen Zlatarov" - Burgas.

1. General situation and biographical data

From 02.09.2019 until now, the candidate Milena Petkova Dimitrova held positions respectively as assistant and chief. assistant doctor at the University "Prof. Dr. Asen Zlatarov" - Burgas.

2. General description of the presented materials

For the entire professional-creative period, he provided a total of 32 scientific works, (monographs, publications that are in referenced and indexed in world-famous databases with scientific information (Scopus; Web of Science) and in non-refereed journals with scientific review or in edited collective volumes, participations in scientific forums, published university textbooks)

and 3 participations in research projects. The complete scientific output includes: one independent monograph (habilitation thesis), three published university textbooks, 32 publications, of which: 8 independent and 24 co-authored, 20 in English. The candidate's participation in the competition is based on scientific production, including 23 scientific works that do not repeat the topic of the doctoral dissertation and are outside the list of publications from the dissertation for the educational and scientific degree "Doctor".

In accordance with the field of higher education, the professional direction and the scientific specialty under the announced competition, submit one independent monograph (habilitation work) according to indicator B.3.1., three published university textbooks, according to a group of indicators E.23.1., E.23.2. and E.23.3., 12 publications from indicator D.7. in full text, of which: 5 independent and 7 co-authored, 12 in English. (scientific publications in publications that are referenced and indexed in world-famous databases with scientific information (Scopus; Web of Science), 7 publications from indicator D.8. in full text, of which: 3 independent and 4 co-authored, 2 of English language. (scientific publications in non-refereed peer-reviewed journals or in edited collective volumes). The candidate participated as supervisor of 1 (one) and as a team member of 3 (three) intra-university research projects. 22 citations in scientific publications in publications that are referenced and indexed in world-renowned databases of scientific information (Scopus; Web of Science).

With regard to the candidate's fulfillment of the conditions for occupying the academic position "Associate Professor" in accordance with ZRASRB and PPZRASB and minimum national requirements, as well as in accordance with PURPNSZAD at the University "Prof. Dr. Asen Zlatarov" Burgas and minimum required points - the candidate fulfills the conditions for occupying the academic position "Associate Professor" in accordance with Art. 24 of ZRASRB and minimum required points for the academic position " Associate Professor ", according to PPZRASB 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". The candidate also fulfills all conditions for occupying the academic position " Associate Professor " in accordance with Art. 67 of the Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at the University "Prof. Dr. Asen Zlatarov" Burgas and minimum required points (Tab. 1).

Table 1

A group of indicators	Associate Professor in accordance with the ZRASRB and PPZRASRB	Associate Professor according to PURPNSZAD at University "prof. Dr. Asen Zlatarov" Burgas	Milena Petkova Dimitrova, ch. assistant, Ph.D
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A	50	50	50
B	-	-	-
C	100	100	100
D	200	300	375,7
E	50	100	220
F	-	100	120
Total:	400	650	865,7

From the submitted report, according to the mandatory requirements of PPRASRB for occupying the academic position "Associate Professor", there are a total of 865.7 points (with a minimum requirement of 650).

She participated in the scientific research work at the NIS of the University as a leader in one and a member of the team in two projects. Twice she participated with articles in the international scientific forum "Education, Science, Economy and Technology".

She has authored and co-authored twelve curricula. He continuously improves his teaching and research skills by participating and learning in events organized by the University.

She participated in the competition with one independent monograph, three published university textbooks and 23 publications.

22 citations were found on the publications.

3. General characteristics of the candidate's research and scientific-applied activity

The scientific contributions in the published materials are directed in three main directions. *The first direction* is related to analyzing and researching the side processes causing contamination of the technological equipment in the oil refining installations (B.3. ; D.7.12). *The second direction* of research is on the specifics of corrosion processes for installations in oil processing complexes (D.7.9., D.7.10., D.7.11.). *In the third direction*, the publications are directed in priority "general engineering" and are related to the removal of sulfur compounds in commodity petroleum products, production of ecological middle distillate fractions and production of conservation oils (publications under indicators D.7.1., D.7.2., D.7.3., D.7.8., D.8.1., D.8.2., D.8.6., D.8.7.). In this direction, according to the candidate's professional training, the results of research related to the change of the thermodynamic properties of the coriander oil-ethanol-water system, chemical risk assessment during transportation by oil pipelines and customs investigation and risk analysis during commercial operations with petroleum products have been published (D.7.4., D.7.5., D.7.6., D.7.7., D.8.3., D.8.4., D.8.5., E.23.1., E.23.2., E.23.3.) . The main research developments are in the field of technological operations in oil refining, the production of meeting the standards related to the growing requirements for the qualities of oil products and the protection of expensive installations from the accompanying processes. It is known the influence of parallel processes in the processing of different types of oil, which form and accumulate pollution of a different nature

in individual areas. They have a significant impact on the correct implementation of the main technological mode of each installation. This requires an in-depth knowledge of the basic mechanisms and parameters of each technological process in order to offer the most suitable equipment protection. This is especially relevant because in oil refining it is necessary to process increasingly low-quality oil or mixtures with an unstable composition. This is a reason in practice to envisage prevention against these processes, which starts even before the start of processing and does not reach critical situations. In these publications, serious attention is paid to the causes of the emergence of various types of side processes, the chemistry of their course and the influence of various factors on their intensity. This makes it possible to apply a correct approach to their removal. In the end, a positive effect is achieved in the direction of the main technological process, preservation of technological equipment and production of standard production. Many in-depth studies have also been carried out regarding the origin, type and manner of formation of pollution on technological equipment, which is one of the main problems in oil refining. Practice shows that this problem on a global scale is deepening, but the published material on its solution is rather scarce. Therefore, I believe that addressing the problem is of global importance for the development of the oil refining industry. Fouling control methods should start long before its formation, already in the process of designing the installations and technological units. It is mandatory to track it from the very start until the critical moments of its accumulation occur. In this regard, in the published monograph, chapter one reflects the applicant's research on the origin, type and manner of formation of pollution. In chapter two, the research is deepened by looking in detail at fouling for each of the different types of installations in oil refining. Taking into account the relevance of this problem in the world practice of oil refining, I appreciate the timely necessity of the information published in this monograph. The correct approach in the fight against fouling in oil refining installations guarantees the production of quality motor fuels (D.7.12.). The European Union increases the requirements for them and constantly creates special norms related to the protection of the environment and human health. The requirements for the content of sulfur compounds are changing dramatically in stages. This gives the oil refining industry the opportunity to change its technologies, to plan and implement the corresponding reconstructions in its installations, which in turn are associated with large capital investments. Achieving higher requirements is directly dependent on the quality indicators of the raw material used. This publication mainly focuses on the influence of the feedstock in the diesel fraction hydrotreating plant with an emphasis on the ongoing undesirable processes accompanying the main process. In this sense, fouling and corrosion processes are most characteristic of these installations. The article examines feedstock from three main processes: from atmospheric distillation, from thermal cracking and from catalytic cracking. As a result, relevant conclusions and recommendations have been made.

In the following three publications (D.7.9.; D.7.10.; D.7.11.) the specifics of corrosion processes in the installations of oil refining complexes and their influence on the formation and accumulation of contamination on the surfaces of the equipment were investigated. Methods are proposed to reduce corrosion processes in the atmospheric oil distillation plant and to introduce inhibitory protection in the bitumen production plants. In publication D.7.10. corrosion attacks have been shown to be a joint risk in oil refineries and petrochemical plants. This results in huge ongoing costs for equipment maintenance and repair. It has been proven that if corrosion is properly identified, it can be slowed, controlled for years to come. With the qualified intervention of service

personnel, losses can be mitigated or completely eliminated by applying a number of modern methods. The appropriate products to minimize corrosion processes throughout the production line are also indicated.

Proper inhibitor protection in atmospheric petroleum distillation plants will result in less corrosion damage. This can also be assumed for the installations for the secondary processing of oil. During the processing of high-sulfur types of oil, part of the sulfur compounds also fall into the obtained oil fractions. Combustion of these products produces sulfur oxides in the atmosphere. With these considerations in mind, environmental regulations worldwide mandate ultra-low sulfur content in commodity fuels. In this direction are the studies of suitable methods for the chemical treatment of oil fractions to remove sulfur compounds by using alternative cleaning methods (D.7.1.; D.8.1.; D.8.2.; D.8.6.; D8.7.). It is indisputably proven that the products of the oil industry have a serious impact on the environment. This influence manifests itself in their production and in their exploitation. The research study in publication D.7.1. is on the status of modern desulfurization methods in the petroleum industry. The advantages and disadvantages of each method are identified and current methods are applied. For this purpose in publication D.8.1. various absorption methods have been investigated for the removal of undesirable compounds. In publication D.8.2. the possibilities for the removal by adsorption of various thiophene compounds, which are very difficult to deal with by modern hydrotreatment, were investigated. Extensive studies have also been carried out on the removal of sulfur-containing compounds using the oxidation of two gas oil fractions (D.8.6.). It was found that for all the studied systems, the oxidation process is thermodynamically possible. Studies have also been made to combine oxidation with absorption methods to obtain deep removal of sulfur and arene compounds (D.8.7.). Studies have been conducted to improve the yield of middle distillate fractions by means of specific additives (D.7.8.). For this purpose, additives of pure arene concentrates and sulfur-containing extracts were used. In this way, it is possible to use products from the selective purification of petroleum products in a qualified manner. Studies on the preparation of complex oil-soluble inhibitors for preservative oils have been published (D.7.2.; D.7.3.). For this purpose, a complex oil-soluble inhibitor was synthesized, the concentration of the individual components in it was optimized without disturbing their stability in the solution and obtaining a maximum protective effect. The researches carried out make it possible to establish the optimal temperature regimes at which the obtained oils can be exploited.

In connection with determining the optimal modes of the extraction processes, studies were conducted to establish the change in the thermodynamic properties of the coriander-ethanol-water system (D.7.5.; D.7.7.). The studies were continued with different water-oil emulsions. At the same time, a number of thermodynamic parameters of the ongoing processes were established. In the research done, the influence of nickel as the most used metal in binary and ternary mixtures was traced and is one of the most attackable metal alloys used in the structural elements of oil refining equipment. The materials themselves and their products probably influence the rate of corrosion processes (D.7.4.; D.7.6.). As a result of these studies, compositions have been proposed that are the most resistant to the ongoing side processes in the processing of petroleum raw materials and the production of standard commodity fuels.

The modern and ecological trends used in the practice of collection, storage, securing and recycling in the ports of our country, of spent marine oils (D.8.3.; D.8.4.) have been studied. As a

result, the chemical risk during transportation and storage of products from the oil refining industry has been assessed. World practice shows that work in this field has a high degree of risk, and methods are proposed to establish the causes and mitigate and control any accidents in this area. The accumulated practical experience allows the candidate to publish a three-part study guide necessary for teaching students in the relevant specialized master's program.

In conclusion, I believe that the presented research and publication activity corresponds to the theme of the competition. Nine publications are presented outside the competition, which are included in the dissertation work for obtaining the Doctorate of the National Academy of Sciences and are in the same direction. They are not the subject of this review.

Ch. assistant Milena Dimitrova, PhD, took part in a total of 4 Bulgarian and international projects financed on topics in the NIS of the University "Prof. Dr. Asen Zlatarov" - Burgas.

The candidate participated in 2 scientific forums with international participation.

4. Assessment of the candidate's pedagogical training and activity

Ch. Assistant Milena Dimitrova, PhD, is actively involved in the teaching and learning process. The candidate leads lectures and exercises on basic disciplines in the field of oil processing and operational characteristics of fuel-lubricant products and on customs service in operations with excise goods during the preparation of students for bachelor's and master's degrees. Until now ch. assistant Milena Dimitrova, PhD, has a full annual workload determined according to the requirements in the decisions of the academic council of the University "Prof. Dr. Asen Zlatarov" - Burgas.

5. Main scientific and scientific-applied contributions

According to the nature of the research and publication activity, the main scientific and scientific-applied contributions of the research work of ch. Assistant Dr. Milena Petkova Dimitrova can be summarized as follows:

1. In-depth studies of the corrosion processes during the processing of raw material RES (Russian export mixture) in the installations for atmospheric distillation of oil have been carried out. (D.7.9.) The correct methods for corrosion protection of technological equipment in oil refining installations have been established and implemented, and the result is not only economic. An ecological effect has also been achieved. (D.7.9.); (D.7.10.); (D.7.11.); (D.7.12.). The intensity of the corrosion processes in the condensate part of a bitumen production plant was determined. (D.7.11.); (Q.3.)
2. Fouling formation processes in industrial conditions are studied in detail and suitable methods for their minimization are indicated. (D.7.9.); (D.7.10.); (D.7.12.). Data were obtained regarding the formation of fouling when subjected to three strictly characteristic diesel fractions of hydrotreatment in industrial conditions. (D.7.12.)
3. Possibilities were followed and experiments were conducted to obtain a complex inhibitor for conservation oils from petroleum products and petroleum waste. The optimal dosages of the obtained inhibitors to achieve an acceptable inhibitory protection of the preservative oil were determined. (D.7.2.); (D.7.3.). Previously obtained complex inhibitors with different contents of anodic, cathodic and shielding components were tested, and the most effective inhibitor for transmission oils was found.
4. For the first time, studies were conducted on the recovery and application of extracts obtained from the selective purification of middle distillate fractions and the process of

- adsorption of thiophene compounds contained in these fractions was studied in detail. (D.7.8.); (D.8.2.); (D.8.6.); (D.8.7.)
5. An alternative oxidation-extraction method for purification of middle-distillate components with appropriately selected two polar solvents was applied. (D.8.7.); (D.8.2.). Model equations characterizing the process of purification of middle distillate components are derived. (D.7.8.). Laboratory experiments were carried out to obtain ultrapure products from the distillation of petroleum with respect to the content of sulfur and polyarene hydrocarbons. (D.8.1.); (D.7.8.)
 6. The thermodynamic parameters of the oxidation processes of individual gas fraction systems were monitored in laboratory conditions and it was established that the oxidation process is thermodynamically possible. (D.8.6.)
 7. Ni-Sn and Ni-Ti binary systems were studied by DTA analysis and extrapolated to ternary systems. Ternary compounds are represented by sublattice models. (D.7.6). It was established which of the studied emulsions with the addition of soy protein isolates showed greater stability. (D.7.7.)
 8. Methods for safe collection, storage and disposal of waste from transport tankers for oil and oil products are specified. A strategy is given for controlling oil spills, respectively, preventing environmental pollution of the sea and adjacent land areas. (D.8.4.)
 9. With the implemented complex chemical treatment to inhibit the corrosion and fouling processes, the following is achieved: Extending the life of the technological equipment as a result of implemented inhibitor protection and antifouling programs. (D.7.9.); (D.7.10.); (D.7.11.); (D.7.12.); (C.3.); Reduction of the number of emergency shutdowns of the installations, as a result of extinguishing the corrosion processes (D.7.9.); (D.7.10.); (D.7.11.); (D.7.12.); (C.3.); Reduction in the amount of malfunctions due to reduced forced shutdowns, which leads to a reduction in the total costs of oil refining installations (D.7.9.); (D.7.10.); (D.7.11.); (D.7.12.); An effective inhibitor system has been implemented to protect the technological equipment in conditions of obtaining bitumen. An ecological effect was also achieved - the acidic separation waters are neutralized and the sewage waters are not further polluted. (D.7.11.); Improvement of heat exchange due to the limitation of contamination, especially in the heat exchange equipment; (D.7.9.); (D.7.10.); (D.7.11.); (D.7.12.); (C.3.); Reduction of losses of heat agents in oil refining installations during control of corrosion and fouling processes. (D.7.9.); (D.7.10.); (D.7.11.); (D.7.12.); In the process of studying the possibilities of modern desulfurization methods - HDS, ODS, absorption and BDS, a reduction of harmful emissions in the atmosphere was found. The information from the in-depth study is useful for the engineering and technological personnel of the secondary processing of oil and petroleum raw materials. (D.7.1.); (D.7.11.); (D.7.12.)

6. Critical notes and recommendations

I have no critical comments on the substance and technical presentation of the materials for the competition, I would only recommend that the candidate in the future direct her attention to joint scientific and research work with students and active participation in national and international forums.

7. Personal impressions and opinion of the reviewer

The volume and scope of the candidate's scientific output shows that she works in promising and interesting scientific and scientific-applied fields, has ideas and offers concrete solutions to the

identified problems. This defines her as an established and recognized scientist and specialist in her field, which is a prerequisite for her future development.

CONCLUSION

Ch. assistant Milena Petkova Dimitrova, Ph.D., has proven herself as a scientist with rich teaching and research experience and a rich volume and content of scientific production. The materials submitted for the competition show that chap. Ch. assistant Milena Petkova Dimitrova, Ph.D. Eng., exceeds all the requirements for the occupation of the academic position "Associate Professor", included in the ZRASRB, the Regulations for its implementation, as well as Section III "Conditions for the occupation of the academic position "Associate Professor" of the Regulations on the conditions and the procedure for acquiring scientific degrees and occupying academic positions at the University "Prof. Dr. Asen Zlatarov" - Burgas. The evaluation of the candidate's scientific output and educational activity shows compliance with the scientometric criteria with a good contribution character and results with scientific and practical value. Taking into account her professional development, as well as her scientific performances, I give my positive assessment for her election as "Associate Professor" and I strongly recommend the members of the respected scientific jury to award ch. Assistant Milena Petkova Dimitrova the academic position "Associate Professor" in the field of higher education 5. Technical sciences, professional direction 5.13. General engineering, science specialty 02.10.23. "Technology of natural and synthetic fuels" for the needs of the Department of "Industrial Technologies and Management" in the Faculty of Social Sciences at the University "Prof. Dr. Asen Zlatarov" - Burgas.

15.08.2023г.
Varna

Reviewer:.....
/Assoc. Prof. PhD. Sibel Ilhanova Ahmedova/