OPINION

from

assoc. prof. Simeon Aleksandrov Ribagin
Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Sciences,
member of a scientific committee appointed by order № 73/24.01.2024 from of the Director of the
Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Sciences

Regarding: dissertation work of Borislav Enchev Georgiev, Phd student at department of "Bioinformatics and Mathematical Modelling" IBFBMI – BAS, submitted for obtaining the educational and scientific degree "PhD" in the field of higher education 4. Natural sciences, mathematics an informatics", Professional field 4.6 „Informatics and computer sciences ", doctoral specialty: 01.01.12. „Informatics ". Title of the PhD thesis: „Investigation of oil refining processes using intercriteria analysis"

Scientific consultants: Acad. Krassimir Atanassov, DSc, DSc and prof. Dicho Stratiev, DSc

The dissertation of mag. Eng. Borislav Enchev Georgiev is dedicated to one of the most challenging and at the same time economically important part of modern oil refining, namely to investigate the most cost-effective processes of oil refining: Hydrocracking of vacuum resedue H-Oil" and of "Catalytic Cracking of vacuum gasoil. For this purpose, in the dissertation, it is proposed to investigate the possibilities of the intercriteria analysis, as a tool for finding the optimal conditions ensuring high profitability of the oil refining process.

The thesis was discussed and accepted for defense at an extended scientific seminar of the department of "Bioinformatics and Mathematical Modeling" of IBFBMI-BAS on 12.01.2024., it is structured according to the requirements and includes: an introduction, 5 chapters and a conclusion section with a volume of 203 pages.

The initial chapter of the dissertation presents a thorough literature review, demonstrating the author's extensive knowledge on the subject matter. Additionally, the published data pertaining to the problem are very well analyzed and summarized. The study encompasses the hydrocracking of tar and the catalytic cracking of vacuum gas oil in the treatment of diverse raw materials and catalysts with varying characteristics. Additionally, it delves into the theoretical and applied aspects of the intercriteria analysis approach employed for the investigation of oil refining procedures. Eng. Georgiev has extensively referenced 299 literary sources in his dissertation work. His profound understanding of the problem at hand has enabled him to purposefully and convincingly define the goal of his research. To accomplish this goal, he has formulated five main scientific tasks. The achievement of the same is presented in the next three chapters, in which the scientific value of the dissertation work is actually revealed.

The doctoral student's research findings greatly enhance the existing scientific understanding of the utilization of different techniques for analyzing the group hydrocarbon composition (SARA) of tars

derived from diverse oil sources. Additionally, the study sheds light on the potential application of intercriteria analysis in identifying economically and technologically advantageous conditions for processing technologically challenging oil varieties. A significant contribution of the PhD student is the identification of the factors that influence the enhancement of conversion through the utilization of intercriteria analysis. Additionally, they have shown that the increased removal of metals and the enhanced activity of the catalyst in the initial reactor, resulting from the majority of fresh catalyst being introduced into the first reactor, play a role in reducing the formation of sludge during the processing of vacuum residues from Ural and Siberian light oils with a higher content of saturated hydrocarbons.

The results are outlined comprehensively and supported by 31 tables and 46 figures throughout the dissertation..

The doctoral student's dissertation work yielded significant outcomes, which have been disseminated through 7 scientific publications. Notably, these publications have garnered a total of 31 citations, highlighting the impact and relevance of the research. Among the publications, 4 have been published in scientific journals with notable impact factors. (2 in ASC Omega IF=3.512, 1 in Chem. Eng. Technol. IF= 1.728 and 1 in Appl. Sci. IF= 2.838). These achievements underscore the scholarly contributions made by the PhD student and the recognition received within the scientific community.

The abstract of the thesis that has been submitted encompasses all the primary information of the dissertation, demonstrating precise formatting and effectively summarizing the conducted research and obtained results.

Conclusion

I am of the opinion that the dissertation presented here is a comprehensive and meticulously conducted study, which makes significant scientific contributions. It fully satisfies the requirements stated in the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations of the IBFBMI - BAS regarding the conditions and procedures for obtaining scientific degrees. With utmost confidence, I highly recommend the respected Scientific Jury to award Eng. **Borislav Enchev Georgiev** the educational and scientific degree of "**PhD**" in the professional field of 4.6 "**Informatics and computer sciences**", within the Doctoral program of 01.01.12 "**Informatics**".

Sofia Signature:

Date: 17.04.2024 **/ assoc. prof. Simeon Ribagin/**