

Report on the work of the Dissertation Council in the direction of Engineering and Engineering affairs (GEP D097- «Chemical Engineering and Processes» EP «8D07109 - Innovative Technologies and New Inorganic Materials»; GEP D108 – «Nanomaterials and Nanotechnologies» EP «8D07114 - Nanomaterials and Nanotechnologies») of the NJSC «Kazakh National Research Technical University named after K.I. Satbayev»

1. Data on the number of meetings held -- 2 meeting.
2. Surnames, first names, patronymics (if any) of the members of the dissertation council who attended less than half of the meetings: none.
3. List of doctoral students with indication of the organization of training:
 - Raimbekova A.S. – NJSC «Kazakh National Research Technical University named after K.I. Satbayev»;
 - Omarov Bekzhan Temirkhanuly – NJSC «South Kazakhstan University named after M. Auezov».

4. Brief analysis of dissertations considered by the Council during the reporting year

№	Full name of the doctoral student	Dissertation topic	Code and title of specialty
1	Raimbekova Ainur Saginzhankyzy	Preparation and study of the properties of manganese-containing anti-corrosion materials based on technogenic raw materials from Kazakhstan	Educational program «8D07109 - Innovative technologies and new inorganic materials»
2	Omarov Bekzhan Temirkhanuly	Development of innovative technology of complex humate containing mineral fertilizers production	6D072000 – «Chemical technology of inorganic substances»

4.1. The analysis of the subject of work of Raimbekova Ainur Saginzhankyzy "Preparation and study of the properties of manganese-containing anti-corrosion materials based on technogenic raw materials from Kazakhstan", submitted for the degree of Doctor of Philosophy (PhD) in the Educational program "8D07109 - Innovative technologies and new inorganic materials". One of the urgent global problems of our time is the problem of recycling a huge mass of industrial waste, among which the central place is occupied by waste from mining and processing enterprises, including dumps of overburden and host rocks, as well as tailings of ore dressing. This waste is used only in small quantities in the production of construction materials, and the bulk is stored in tailings dumps and is not recycled. Also relevant for Kazakhstan as well as for the CIS countries is the problem of corrosion of steel structures and pipelines, which are operated without special protective measures. Corrosion not only leads to metal loss, but also has a negative impact on the environment due to accidents caused by corrosion damage.

The scientific results and provisions of this dissertation are new. When performing the dissertation work:

- for the first time, based on the study of the material and phase composition of waste from overburden and beneficiation of manganese ore at the Zhayrem deposit, manganese-containing phosphate products have been obtained and showed the possibility of their use as anticorrosion materials for protecting low-carbon steel from corrosion in aqueous medium;
- acid-thermal synthesis of calcium-manganese phosphate products based on ore dressing tailings was carried out. It was shown for the first time that the formation of highly soluble reagents

that can be used as corrosion inhibitors of low-carbon steel in neutral aqueous media is possible at a temperature of 200 °C and a molar ratio of the main components in terms of oxides $\text{CaO}:\text{MnO}:\text{P}_2\text{O}_5 = 1.00:0.11:1.54$;

- for the first time, the corrosion behavior of low-carbon steel (St3) in a neutral aqueous medium in the presence of a calcium-manganese phosphate product synthesized on the basis of waste from the enrichment of manganese ore from the Zhairam deposit at 200 °C was studied and it was shown that calcium-manganese phosphate inhibitor $(\text{Ca},\text{Mn})(\text{PO}_3)_2$ reduces the rate of corrosion of steel (St3) in the entire studied concentration range from 1.0 to 100.0 $\text{mgR}_2\text{O}_5/\text{l}$. At the same time, the degree of inhibitory effect lies in the range of 20.2 - 98.2%. For the first time, the morphology of the surface of protective films formed on a steel surface in solutions of a synthesized inhibitor was studied and a distribution map of the chemical elements included in the films was compiled;

- it was shown, for the first time, that the calcium-manganese phosphate inhibitor synthesized from the beneficiation tailings of the Zhairam deposit exhibits high inhibitory efficiency in waters with a high content of corrosion promoters, such as sulfate and chloride ions;

- the process of phosphoric acid extraction of manganese from overburden waste has been studied for the first time. The optimal conditions for conducting the process are determined by the heat. Corrosion tests of phosphate coatings formed on steel in the resulting phosphating solution have shown that their characteristics meet standard requirements.

The connection of the dissertation topic with the directions of scientific development, which are formed by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan in accordance with paragraph 3 of Article 18 of the Law "On Science" and (or) state programs. The topic of the dissertation corresponds to the scientific direction "Rational use of natural resources, including water resources, geology, processing, new materials and technologies, safe products and designs".

The dissertation work was completed in accordance with the research plan of the Department of Chemical Processes and Industrial Ecology of the "Kazakh National Research Technical University named after K.I. Satbayev" for state-funded research №BR05236302 "Scientific and technical justification of chemical cluster innovations in the field of creating new materials and technologies to increase the efficiency and environmental sustainability of industrial production" (2018-2020 yy.) and №BR21881939 "Development of resource-saving, energy-generating technologies for the mining and metallurgical complex and creation of an innovative engineering center" (2023-2025 yy.)..

Analysis of the level of implementation of dissertation results into practical activities.

Based on the results of dissertation research, 9 works were published, including 2 articles in an international journal included in the Scopus and Web of Science databases (the CiteScore percentile indicator is 35% and 34%, respectively, which is equivalent to 2 articles recommended by the Committee for Quality Assurance in Science and Higher Education), 1 article in publications recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan, 6 articles were published in the materials of international conferences.

According to the results of the research, 2 patents for utility models of the Republic of Kazakhstan were obtained (Utility model Patent №7655 "Charge for producing a water-soluble metal corrosion inhibitor", Bulletin №2022/0686.2 dated 12/9/2022. Utility model Patent №7652 "Method for obtaining manganese phosphating concentrate", Bulletin №2022/0735.2 from 09.12.2022).

The research results were tested at the international scientific and practical conference "Correlational Interaction of Science and Practice in the New World" (2020, St. Petersburg, Russian Federation); the III International Scientific and Practical Conference "Science and Business-2021" (2021, Almaty, Kazakhstan); the 5th International Scientific and Technical Internet Conference "Innovative Development of Resource-saving Technologies and Sustainable Use of Natural Resources" (2022, Petroșani, Romania); the International Conferences "Satpayev Readings - 2021" and "Satpayev Readings - 2023" (Almaty, Kazakhstan); the International Scientific and Technical

Conference "Actual Problems of Creation and Use of High Technologies for Processing Mineral Resources" (2023, Tashkent, Uzbekistan).

Results of the dissertation work of Raimbekova Ainur Saginzhankyzy on the topic "Preparation and study of the properties of manganese-containing anti-corrosion materials based on technogenic raw materials from Kazakhstan", which have high theoretical and practical significance, can be introduced both into the production of new domestic anti-corrosion materials and into the educational process to improve the quality of training specialists in the field of inorganic substance technology and industrial ecology (Act of implementation in the educational process, 2023).

4.2 Analysis of the topic of the work of Bekzhan Temirkhanovich Omarov "Development of innovative technology of complex humate containing mineral fertilizers production" submitted for the degree of Doctor of Philosophy (PhD) in the specialty 6D072000 - "Chemical technology of inorganic substances". The Republic of Kazakhstan is actively engaged in agriculture, so today improving the quality of agricultural products in the country is one of the priority tasks. Processing of industrial waste is also among the urgent and unresolved problems. The study of methods for obtaining humate-containing mineral fertilizers using natural raw materials and man-made industrial waste is one of the most important tasks. The main elements of soil fertility are the presence of N, P, K, humic substances and microelements. The only solution to this problem is to establish the production of humate-containing fertilizers.

In coal deposits, millions of tons of low-calorie coals formed in oxidized surface layers and unsuitable for combustion remain unclaimed. These wastes are prone to spontaneous combustion.

At the same time, the raw materials used for the production of fertilizers are waste from phosphorus production, namely, tertiary return fine particles formed after the AKM-312 agglomeration machine, as well as cyclone dust and dust from electric filters. Their composition includes P_2O_5 (total) from 19.8 to 22.86%, as well as oxides of Ca, Mg, K, Na, S, F and microelements that promote plant growth and development. The technology for obtaining complex organomineral fertilizers from brown coal humates proposed in this paper is simple and does not require significant costs.

The connection of the dissertation topic with the directions of scientific development, which were formed by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan in accordance with paragraph 3 of Article 18 of the Law "On Science" and (or) state programs. The dissertation was completed at the Department of "Technology of Inorganic and Petrochemical Industries" and the scientific-research laboratory "Inorganic Salts, Plant Protection, and Growth Stimulators" of M.Auezov South Kazakhstan University. It aligns with the research work of the Department of Inorganic Chemistry and Technology (ChTIS) as part of the state budget program for 2016-2022 and the state-funded project 2021-2025 GBPNIR 21-03-02: "Development of new promising technologies for the production of inorganic products, environmentally friendly fertilizers, and plant growth stimulators based on mineral raw materials and technogenic waste, as well as improvement of traditional technologies." Additionally, the work was performed under the project AR15473348 "Development of a new technology for producing complex humate-containing mineral fertilizers," funded through the "Young Scientist-2022" grant program.

Analysis of the level of implementation of dissertation results in practical activities. Based on the results of dissertation research, 19 works were published, including 3 in international scientific publications included in the Scopus database, 3 in journals recommended by the Committee on International Scientific and Practical Research of the Ministry of Education and Science of the Republic of Kazakhstan, 11 articles in the materials of International and Republican scientific and practical conferences, 1 innovative patent of the Republic of Kazakhstan and 1 monograph was published.

5. Analysis of the work of official reviewers

№	Full name of the doctoral student	Reviewers	
		Full name of the 1st reviewer (position, academic degree, title, number of publications in the specialty over the past 5 years)	Full name of the 2nd reviewer (position, academic degree, rank, number of publications in the specialty over the past 5 years)
1	Raimbekova Ainur Saginzhankyzy	Efremov S.A. – Doctor of Chemical Sciences, Professor, Academic of the KazNANS, Professor of Analytical, Colloidal Chemistry and Technology of Rare Elements, Faculty of Chemistry and Chemical Technology, KazNU named after Al-Farabi, (Almaty, Republic of Kazakhstan), h-index – 5; has more than 5 scientific publications on the educational program 8 D 07109 – “Innovative Technologies and New Inorganic Materials”	Kulagina T.A. – Doctor of Technical Sciences, Professor, Honorary worker of the Education Sphere of the Russian Federation, RAS Expert, Head of the Department of Technosphere and Environmental Safety, Siberian Federal University, (Krasnoyarsk, Russia), h-index – 3.. And there are more than 5 scientific publications on the educational program 8 D 07109 - "Innovative technologies and new inorganic materials"
2	Omarov Bekzhan Temirkhanuly	Oshakbayev M.T. – Doctor of Technical Sciences, Professor, Chief Researcher, Laboratory of Chemistry of Fertilizers and Salts, Institute of Chemical Sciences named after A.B. Bekturov (Almaty, Republic of Kazakhstan), h-index – 4; there are more than 5 scientific publications in the specialty 6D072000 – “Chemical technology of inorganic substances”.	Ermagambet B.T. – Doctor of Chemical Sciences, Professor, Director “Institute of Coal Chemistry and Technology” LLP (Astana, Republic of Kazakhstan), h-index – 6; has more than 5 scientific publications in (Scopus) CiteScore above 35 in the specialty 6D072000 – “Chemical technology of inorganic substances”.

6. Data on the considered dissertations for the degree of Doctor of Philosophy (PhD), Doctor of Science

Dissertation Council in the direction of Engineering and Engineering affairs (GEP D097- «Chemical Engineering and Processes» EP «8D07109 - Innovative Technologies and New Inorganic Materials»; GEP D108 – «Nanomaterials and Nanotechnologies» EP «8D07114 - Nanomaterials and Nanotechnologies»)	Code and title specialty/educational program	
	GEP D097- «Chemical Engineering and Processes» EP «8D07109 - Innovative Technologies and New Inorganic Materials»	GEP D108 – «Nanomaterials and Nanotechnologies» EP «8D07114 - Nanomaterials and Nanotechnologies»
Theses accepted for defense	2	-
Including doctoral students from other universities	1	-
Dissertations withdrawn from consideration	-	-
Including doctoral students from other universities	-	-
Dissertations that received negative reviews from reviewers	-	-

Including doctoral students from other universities	-	-
Dissertations with a negative decision following the defense	-	-
Including doctoral students from other universities	-	-
Dissertations submitted for revision	-	-
Including doctoral students from other universities	-	-
Dissertations submitted for re-defense	-	-
Including doctoral students from other universities	-	-

Chairman of the Dissertation Council in the direction of Engineering and Engineering affairs (GEP D097- «Chemical Engineering and Processes» EP «8D07109 - Innovative Technologies and New Inorganic Materials»; GEP D108 – «Nanomaterials and Nanotechnologies» EP «8D07114 - Nanomaterials and Nanotechnologies») of the NJSC «Kazakh National Research Technical University», Candidate of Technical Sciences, Associate Professor

Scientific Secretary of the Dissertation Council, Candidate of Technical Sciences, Associate Professor



S.K. Kabdrakhmanova

Sh.N. Kubekova