Report on the work of the Dissertation Council

Dissertation Council in the direction of "Chemical Processes and Production of Chemical Materials" at NJSC "KazNRTU named after K.I. Satpayev" in the specialties (direction of training):

8D07107 – "Chemical Engineering of Hydrocarbon Compounds";

8D07108 – "Basic Processes for the Synthesis and Production of New Organic and Polymeric Materials".

1. Data on the number of meetings held – 4 meetings.
2. Surnames, first names, patronymics (if any) of the members of the Dissertation Board who attended less than half of the meetings: none.
3. List of doctoral students with an indication of the organization of training:

- Demeubayeva Nurikamal Serikkyzy – KazNRTU named after K. I. Satpayev
- Boranbayeva Laura Yergaliyevna – KazNRTU named after K. I. Satpayev
- Kabdrakhmanova Ainur Kanatovna – KazNRTU named after K. I. Satpayev
- Ryspaeva Salimat Bukenkyzy - KazNRTU named after K. I. Satpayev

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

№	Full name of the doctoral student	Topics of work	Code and name of specialty
1	Demeubayeva Nurikamal Serikkyzy	"Innovative Technologies for the Extraction of Sulfur Compounds and Non-Ferrous Metals from Heavy Raw Materials Using a New Generation of Energy Accumulating Substances"	8D07107 – "Chemical Engineering of Hydrocarbon Compounds"
2	Boranbayeva Laura Yergaliyevna	"Investigation of the processes of paraffin deposition and development of methods to improve the rheological parameters of highly waxy oil"	8D07107 – "Chemical Engineering of Hydrocarbon Compounds"
3	Kabdrakhmanova Ainur Kanatovna	"Development of biostimulants based on complexes of succinic acid derivatives with silver ions"	8D07108 – "Basic Processes of Synthesis and Production of New Organic and Polymer Materials"
4	Ryspaeva Salimat Bukenkyzy	"Deep eutectic solvents as novel inhibitors of asphaltene deposition"	8D07107 – "Chemical Engineering of Hydrocarbon Compounds"

4.1. Analysis of the topic of the work of N.S. Demeubayeva "Innovative Technologies for the Extraction of Sulfur Compounds and Non-Ferrous Metals from Heavy Raw Materials Using a New Generation of Energy Accumulating Substances", submitted for the degree of

Doctor of Philosophy (PhD) in EP 8D07107 – "Chemical Engineering of Hydrocarbon Compounds".

The current state of the petrochemical industry and the energy sector causes a growing interest in the efficient and environmentally friendly processing of heavy hydrocarbon raw materials. In the context of the global depletion of light oil reserves and the transition to the exploitation of fields rich in heavy hydrocarbons, such as Karazhanbas, the relevance of developing innovative refining technologies increases many times over. Heavy oil is characterized by high density, viscosity, content of asphaltenes, resins, sulfur-containing compounds, as well as organometallic complexes of nickel and vanadium. These features significantly complicate the processes of its extraction, transportation and processing, leading to a decrease in economic efficiency and an increase in the negative impact on the environment. The presence of sulfur in the raw material contributes to the formation of hydrogen sulfide and other toxic compounds that increase SO_2 emissions into the atmosphere, which has a harmful effect on the ecological system. High metal content leads to deactivation of catalysts and corrosion of equipment, which increases production costs. Existing methods of oil demetallization and desulfurization, including physical, chemical and biological approaches, have limitations associated with their high energy and resource consumption, complexity of scaling and insufficient environmental safety. In this context, the development of technologies based on energy-accumulating materials, such as activated aluminum alloys, opens up new prospects for creating effective solutions. These materials are able to simultaneously act as reaction and sorption agents, providing a high degree of sulfur and metal recovery with minimal impact on the environment. The topic is becoming more relevant in connection with global trends in decarbonization and tightening environmental standards for the content of sulfur and metals in petroleum products. The introduction of such technologies will contribute to reducing the carbon footprint and fulfilling international obligations in the field of sustainable development. The development of environmentally friendly and resource-saving technologies for processing heavy hydrocarbon raw materials is also in line with Kazakhstan's strategic priorities aimed at modernizing the petrochemical industry and implementing the Concept of Transition to a Green Economy. Thus, this work has a high level of relevance both in the scientific, technical, and socio-economic aspects, offering a solution to an important problem - the creation of a competitive and environmentally friendly technology for processing heavy oil, taking into account the modern requirements of the industry.

Connection of the subject of the dissertation with the directions of development of science, 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 dissertation was carried out within the framework of research projects of grant funding of the Ministry of Education and Science of the Republic of Kazakhstan IRN AP09260008., related to the development of environmentally friendly technologies for the processing of hydrocarbon raw materials, including joint research with enterprises of the petrochemical industry of Kazakhstan. The research related to this work was partially carried out in the laboratory of LRGP (Laboratoire Réactions et Génie des Procédés), Nancy, France, as part of a research internship.

Analysis of the level of implementation of the results of the dissertation in practice. The main results of the dissertation work were published in 7 publications, of which 2 articles in international scientific journals with a percentile of 42 included in the Scopus databases; 1 publication in the journal "Oil and Gas", 4 publications in the materials of international and republican scientific conferences.

4.2 Analysis of the topic of the work of L.E. Boranbayeva "Investigation of the processes of paraffin deposition and development of methods to improve the rheological parameters of highly waxy oil" submitted for the degree of Doctor of Philosophy (PhD) in EP 8D07107 - "Chemical engineering of hydrocarbon compounds".

One of the urgent tasks for the oil industry of Kazakhstan is the transportation of oils with a high content of paraffins and resins produced at a number of fields in the country. In particular, the highly paraffinic Mangyshlak oils and oils of the Kumkol group of fields, as well as the resinous oils

of the Buzachinsky Peninsula, create significant difficulties during transportation through the main oil pipelines. These oils are characterized by high pour points, abnormal viscosity, high shear stress and a tendency to form asphaltene-resinous and paraffin deposits on the inner walls of pipelines. These factors significantly complicate the transportation process, increase energy costs and create additional operating costs. Therefore, improving the low-temperature properties of oil, such as mobility and fluidity, as well as preventing the formation of asphaltene-resin-paraffin (ARPD) deposits, are critical to ensuring the efficient operation of the oil transportation infrastructure. Existing methods of reducing the cost of transporting highly paraffinic oils include regulating the composition of the oil mixture produced at West Kazakhstan fields. The formation of a mixture with an optimal ratio of components allows you to improve its rheological properties and physicochemical characteristics. An increase in the share of light Aktobe oils in the mixture can significantly reduce viscosity and improve fluidity, which will facilitate transportation. At the same time, the fractional and component composition of oil changes, including the concentrations of paraffins, asphaltenes and resins, which leads to a restructuring of the structure of the oil dispersed system. Changes in the dispersion structure make oil more susceptible to thermal and depressor treatment, which helps to prevent the formation of paraffin deposits and reduce energy costs during transportation. Thus, the study of paraffin deposition processes and the development of methods for improving the viscosity of highly paraffinic oils is not only an urgent task from a scientific point of view, but also of considerable practical interest. Conducting such a study will create effective oil transportation technologies, reduce operating costs and increase the overall profitability of oil production and transportation in Kazakhstan. This makes this direction especially important and justified for implementation within the framework of the dissertation.

Connection of the subject of the dissertation with the directions of development of science, 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 research wascarried out within the framework of program-targeted funding of the Ministry of Science and Higher Education of the Republic of Kazakhstan for 2024-2026 BR24992868 "Development of innovative technology and software products for the use of multicomponent alloys to increase the productivity of high-viscosity oil wells" Contract No 375 PCF 24-26 dated 01.10. 2024.

Analysis of the level of implementation of the results of the dissertation in practice. The main results obtained in the course of the dissertation research have been published in three scientific journals. Among them are two articles published in international journals with a percentile of 60 and one article with a percentile of 76 included in the Scopus database.

4.3. Analysis of the Topics of the Work of A.K. Kabdrakhmanova "Development of biostimulants based on complexes of derivatives of succinic acid with silver ions", submitted for the degree of Doctor of Philosophy (PhD) in EP 8D07108 – "Basic processes of synthesis and production of new organic and polymer materials".

One of the main tasks of chemistry today is to solve urgent problems of the agro-industrial complex aimed at improving the quality and yield of agricultural crops. It is known that one of the main conditions for its formation is the treatment of substances with compounds that have bioactive properties that are harmless to plants, a complex synthesized in the presence of metal ions, using the concept of "green" chemistry. This, in turn, allows you to get a clean harvest without harming the soil biota and the ecosystem-crop-soil-atmosphere chain. Ecobioligand complexes of d-elements, in particular succinic acid and its derivatives, are widely used in medicine, the production of catalysts, pesticides, the synthesis of ion-exchange and porous materials, as well as in the field of bioengineering. In addition, succinic acid and its derivatives are non-toxic and do not have a mutagenic effect on a living organism, being an intermediate product of the metabolism of the Krebs

cycle. Succinic acid is a ligand that has a chemical structure with two carboxyl groups that can be used as coordination points to produce complex compounds. In the literature, it has been established that intracellular absorption of complexes based on succinic acid and its derivatives is better compared to the participation of other ligands, in combination with silver ions. It has also been revealed that trace elements in a combination of organic ligands, i.e. as part of chelated complexes, are easily absorbed by plants. Another pressing problem of today's reality is the frightening growth of bacterial resistance to antibiotics due to their widespread use, which in turn contributes to the formation of antibiotic-resistant bacteria. This problem can be solved by using the biological activity of d-element complexes with ecobioligands of antibacterial and biofungicidal action. This will allow them to be used as environmentally and biologically effective products that reduce the use of fungicides and pesticides that adversely affect living organisms and the environment. It should be noted that in addition to the adverse impact on a living organism and the environment, fungicides and pesticides contribute to an increase in the cost of the final product. Therefore, the development of effective methods to increase yields and reduce the cost of harvesting is a priority today.

Connection of the subject of the dissertation with the directions of development of science, 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 dissertation was carried out at the Kazakh National Research Technical University named after K.I. Satpayev within the framework of grant funding from the Ministry of Science and Higher Education of the Republic of Kazakhstan, in particular NoAP09260644 "Development of an effective encapsulating composition for multifunctional purposes to increase the yield of leguminous crops" for 2021-2023 and within the framework of the program targeted funding project BR24993105 "Creation of a biotechnological R&D center" for the development and commercialization of agricultural products and technologies" for 2024-2026.

Analysis of the level of implementation of the results of the dissertation in practice. The main results of the dissertation work are published in 14 co-author's works, including 4 articles in international scientific journals included in the Scopus and Web of Science databases; 2 articles in a scientific publication recommended by the Committee for Quality Assurance in Science and Higher Education (KKSNVO) of the Ministry of Science and Higher Education of the Republic of Kazakhstan; 1 article and 4 abstract of the report in the materials of international and republican scientific conferences; 1 patent of the Republic of Kazakhstan for an invention, 1 patent for a utility model and 1 act of implementation of the results of scientific research, scientific and technical work or the results of scientific and scientific and technical activities.

4.4. Analysis of the topics of the work of Ryspaeva S.B. "Deep eutectic solvents as novel inhibitors of asphaltene deposition", submitted for the degree of Doctor of Philosophy (PhD) in EP 8D07107 - "Chemical Engineering of Hydrocarbon Compounds".

In the 21st century, the growth in demand for energy resources has led to the intensive development of the oil and gas industry. However, the technogenic and chemical problems that arise in the process of oil production and transportation have a negative impact on the efficiency of this area. One of the most challenging problems is the precipitation of asphaltenes. Asphaltenes are complex organic compounds with high molecular weight, rich in heteroatoms and aromatic structures, consisting of polar molecules. In the oil system, they are in an unstable colloidal state and under the influence of physicochemical parameters (for example, a decrease in temperature, a change in pressure, evaporation of light fractions or a change in the nature of solvents) precipitate and separate from oil. The precipitation of asphaltenes leads to blockage of oil pipelines and wells, corrosion of technological equipment, disruption of heat and mass transfer processes. This, in turn, reduces the efficiency of oil production, causes frequent shutdowns of equipment and increases additional economic costs. In this regard, the search for effective inhibitors capable of increasing the stability of asphaltenes or slowing down their deposition is one of the urgent scientific and industrial tasks of our time. In recent years, deep eutectic solvents (GERs) have been of particular interest in this area. ERTs

are liquid systems consisting of two or more components (a donor and a hydrogen bond acceptor) between which hydrogen bonds are formed, as a result of which they have a low melting point, high viscosity, thermal stability and environmental friendliness. They comply with the principles of "green chemistry" and are used as non-toxic, biodegradable solvents in various fields – pharmaceuticals, metallurgy, electrochemistry and extraction technologies. In this dissertation, systems based on choline:glycerol chloride, choline:ethylene glycol, betaine:glycerol and betaine:ethylene glycol are investigated, and their inhibitory properties against asphaltenes are compared with the traditional inhibitor of asphaltene precipitation, dodecylbenzenesulfonic acid. This research is aimed at the development of "green" technologies and environmentally friendly chemical processes and can make a significant scientific contribution to oil production and transportation. Thus, the relevance of the dissertation lies in the need to search for and study environmentally friendly and effective alternative solvent systems that can solve the problem of asphaltene deposits formation during oil production. The results obtained can serve as the basis for the creation of a new generation of inhibitors suitable for industrial use.

Connection of the subject of the dissertation with the directions of development of science, 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 dissertation was carried out at the Kazakh National Research Technical University named after K.I. Satpayev within the framework of grant funding from the Ministry of Science and Higher Education of the Republic of Kazakhstan, in particular No AP26194947 "Environmentally friendly deep eutectic solvents as new innovative inhibitors of asphaltene deposition" for 2025-2027.

Analysis of the level of implementation of the results of the dissertation in practice. The main results of the dissertation work were published in 5 joint author's publications, including 1 article in an international scientific journal indexed in the Scopus database; 3 articles in journals recommended by the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan; as well as 1 material at international and republican scientific conferences.

5. Analysis of the work of official reviewers (with examples of the most low-quality reviews)

№	Name doctoral student	Reviewers	
		Reviewer 1 Name (position, academic degree, title, number of publications in the specialty over the past 5 years)	**Reviewer 2 Name (position, academic degree, title, number of publications in the specialty over the past 5 years)**
1	Demeubayeva Nurıkamal Serıkkyzy	Aubakirov Yermek Aitkazynovich - Doctor of Chemical Sciences, Professor, Head of the Department of Physical Chemistry, Catalysis and Petrochemistry of the Al-Farabi Kazakh National University, Almaty, Kazakhstan. The h-index (h-index) is 10, there are more than 10 publications in (Scopus) CiteScore above 35 in the EP of a doctoral student 8D07107 - "Chemical engineering of hydrocarbon compounds"	Abilmagzhanov Arlan Zainatullayevich – Ph.D., First Deputy General Director of the D.V. Sokolsky Institute of Fuel, Catalysis and Electrochemistry JSC, Almaty, Kazakhstan. The h-index (h-index) is 5, there are more than 4 publications in (Scopus) CiteScore above 35 for the doctoral student's EP 8D07107 - "Chemical Engineering of Hydrocarbon Compounds"

2	Boranbayeva Laura Yergaliyevna	Kusman Dosumov - Doctor of Chemical Sciences, Professor, Chief Researcher of the Al-Farabi Kazakh National University, Almaty, Kazakhstan. The h-index is 9, there are more than 6 publications in (Scopus) CiteScore above 35 in the EP of a doctoral student 8D07107 - "Chemical engineering of hydrocarbon compounds"	Svetlana A. Tungatarova – Doctor of Chemical Sciences, Professor, Head of the Laboratory of Oxidative Catalysis, D.V. Sokolsky Institute of Fuel, Catalysis and Electrochemistry JSC, Almaty, Kazakhstan. The h-index (h-index) is 7, there are more than 6 publications in (Scopus) CiteScore above 35 in the EP of doctoral student 8D07107 - "Chemical engineering of hydrocarbon compounds"
3	Kabdrakhmanova Ainur Kanatovna	Akylbekov Nurgali Ikramovich - PhD, Associate Professor. Professor, Chief Researcher of the Laboratory of Engineering Profile "Physical and Chemical Methods of Analysis" of the Kyzylorda University named after Korkyt Ata (Kyzylorda, Republic of Kazakhstan). The h-index (h-index) is 8, there are more than 10 publications in (Scopus) CiteScore above 35 for the doctoral student's EP 8D07108 – "Basic processes of synthesis and production of new organic and polymer materials"	Kazankapova Maira Kuttybaevna – PhD, Associate Professor. Professor, Leading Researcher, Head of Laboratory of the Institute of Coal Chemistry and Technology LLP, Astana, Kazakhstan. The h-index (h-index) is 7, there are more than 6 publications in (Scopus) CiteScore above 35 in the doctoral student's EP 8D07108 – "Basic processes of synthesis and production of new organic and polymer materials"
4	Ryspaeva Salimat Bukenkyzy	Tileuberdi Yerbol - PhD, associate professor. Professor of the Kazakh National Pedagogical University named after Abai (Almaty, Kazakhstan). The h-index (h-index) is 10, there are more than 12 publications in (Scopus) CiteScore above 35 in the doctoral student's EP 8D07107 - "Chemical engineering of hydrocarbon compounds"	Zhumabek Manapkhan – PhD, Senior Researcher at the D.V. Sokolsky Institute of Fuel, Catalysis and Electrochemistry (Almaty, Kazakhstan). The h-index (h-index) is 5, there are more than 15 publications in (Scopus) CiteScore above 35 in the EP of doctoral student 8D07107 - "Chemical engineering of hydrocarbon compounds"

Proposals for further improvement of the system of training of scientific personnel: To increase the requirements for the work of scientific consultants (especially from Kazakhstan) of doctoral students in terms of the proposed topics of dissertation research and their guidance in the training of scientific personnel.

6. **Data on the considered dissertations for the degree of Doctor of Philosophy, PhD, Doctor in Profile**

Dissertation Council	Code and name Specialties	
	8D07108 – "Basic Processes of Synthesis and Production of New Organic and Polymer Materials"	**8D07107 - "Chemical Engineering of Hydrocarbon Compounds"**
Dissertations accepted for protection	1	3
Including doctoral students from Other universities	-	-
Dissertations withdrawn from Considerations	-	-
Including doctoral students from other universities	-	-
Dissertations for which negative results were received Reviewers' reviews	-	-
Including doctoral students from other universities	-	-
Dissertations with negative decision based on the results of the defense	-	-
Including doctoral students from other universities	-	-
Dissertations aimed at revision	-	-
Including doctoral students from other universities	-	-
Dissertations for re-defense	-	-
Including doctoral students from other universities	-	-

Chairman
of the Dissertation Council in the direction of
"Chemical processes and
Production of Chemical Materials" **B.S. Selenova**

Scientific Secretary
of the Dissertation Council in the direction of
"Chemical processes and
Production of Chemical Materials" **A.Ye. Ayazbayeva**