Project name, IRN	AP26199599 – Development of energy- and nature-saving technology for processing titanium-containing concentrates
Completion date	10.07.2025-31.12.2027
Project supervisor	Zhuniskaliyev Talgat
Report	The main objective of this project is to develop an environmentally friendly technology by optimizing metallothermic FeTi production conditions and to determine the production parameters of synthetic rutile by carbothermic method and to obtain high purity TiO2 by a following hydrometallurgical method. The core objective of this project is to harness the potential of domestic ilmenite concentrates through the implementation of sustainable and energy-efficient methods. Ilmenite, a rich source of titanium, presents an opportunity for environmentally responsible utilization. In pursuit of this goal, we have devised a multi-faceted approach that combines metallothermic and carbothermic techniques, supplemented by a hydrometallurgical enrichment process. The ultimate aim is to produce valuable titanium-containing products, including Ferrotitanium (FeTi), synthetic rutile, and high-purity titanium dioxide (TiO2). One of the standout features of this project is the utilization of metallothermic processes to produce FeTi, a critical alloy with diverse applications in the steel industry, aerospace, automotive, and more. The method chosen requires remarkably low energy input and boasts near-zero direct emissions, exemplifying the environmentally conscious ethos of this research. The carbothermic approach is equally noteworthy. It is employed to extract synthetic rutile from domestic ilmenite concentrates, a vital step in obtaining high-purity titanium. By removing impurities, including iron, and optimizing the carbothermic process parameters, we aim to produce a synthetic rutile of exceptional quality. The project's third component is dedicated to the hydrometallurgical enrichment of synthetic rutile, ensuring the highest degree of purity for the resultant titanium dioxide (TiO2). This phase underlines our commitment to the entire lifecycle of materials, from extraction and production to refinement and application.
Purpose	The main objective of this project is to develop an environmentally friendly technology by optimizing metallothermic FeTi production conditions and to determine the production parameters of synthetic rutile by carbothermic method and to obtain high purity TiO2 by a following hydrometallurgical method.
Expected results	It will be published: - not less than 3 (three) articles and/or reviews in peer-reviewed scientific journals indexed in the Science Citation Index Expanded of the Web of Science database and/or having a percentile by CiteScore in the Scopus database of not less than 50 (fifty), and not less than 1 (one) patent for an invention (including a positive decision thereon), and not less than 2 (two) articles or reviews in a peer-reviewed foreign or domestic journal recommended by KOKNVO.

	One of the articles must have a category – multidisciplinary (of multidisciplinary or interdisciplinary practical application) on the tasks of enterprises from the real sector of the economy of Kazakhstan, and the results of the project must also include design and engineering documentation prepared in accordance with the Unified System for Design Documentation (hereinafter – ESKD). For domestic journals from List 1 of KOKNVO, not belonging to the multidisciplinary category, the journals from Lists 1 and 2 of KOKNVO, which are indexed in two or more categories, are counted. - or not less than 2 (two) articles and/or reviews in peer-reviewed scientific journals indexed in the Science Citation Index Expanded and included in the 1 (first) and/or 2 (second) quartile by impact factor in the Web of Science database and/or having a percentile by CiteScore in the Scopus database of not less than 65 (sixty-five), and not less than 2 (two) articles or reviews in a peer-reviewed foreign or domestic journal recommended by KOKNVO. One of the articles must have a category – multidisciplinary (of multidisciplinary or interdisciplinary practical application) on the tasks of enterprises from the real sector of the economy of Kazakhstan, and the results of the project must also include design and engineering documentation prepared in accordance with ESKD. For domestic journals from List 1 of KOKNVO, not belonging to the multidisciplinary category, the journals from Lists 1 and 2 of KOKNVO, which are indexed in two or more categories, are counted. - or not less than 1 (one) article or review in a peer-reviewed scientific journal indexed in the Science Citation Index Expanded and included in the 1 (first) quartile by impact factor in the Web of Science database and/or having a percentile by CiteScore in the Scopus database of not less than 80 (eighty), and not less than 1 (one) patent for an invention and/or utility model (including a positive decision thereon), and not less than 1 (one) article or review in a peer-reviewed foreign or domestic journal recommended by KOKNVO. One of the articles must have a category – multidisciplinary (of multidisciplinary or interdisciplinary practical application) on the tasks of enterprises from the real sector of the economy of Kazakhstan, and the results of the project must also include design and engineering documentation prepared in accordance with ESKD. For domestic journals from List 1 of KOKNVO, not belonging to the multidisciplinary category, the journals from Lists 1 and 2 of KOKNVO, which are indexed in two or more categories, are counted.
Research group	1) Zhuniskaliyev Talgat Tokashovich, doctor of Philosophy (PhD), Associate Professor (docent). Head of the project. Scopus ID: 57218196497 Researcher ID: AAG-6131-2021

	https://orcid.org/0000-0001-9757-0605 2) Chekimbayev Askar Farzantovich, Candidate of Technical Sciences Scopus Author ID: 6506357731 ResearcherID: EOB-4433-2022 https://orcid.org/0000-0002-4796-7935 3) Kuatbai Erbol Kuatbayuli, Higher education, Metallurgical Engineer, Doctor of Philosophy (PhD) Scopus Author ID: 57218196966 Researcher ID: ABE-5679-2021 https://orcid.org/0000-0002-8400-3537 4) Yücel Onuralp, Professor, Doctor Scopus Author ID: 57189054412 ResearcherID: ABB-3025-2020 https://orcid.org/0000-0002-3879-0410 5) Mukhambetkaliev Azamat Bolatovich, Higher Education, Metallurgical Engineer, Master of Technical Sciences Scopus Author ID: 57218196432 ResearcherID: DIJ-5079-2022 https://orcid.org/0000-0001-9163-1438 6) Sönmez Mehmet Şeref, Associate Professor, Doctor Scopus Author ID: 7004059246 ResearcherID: N-8852-2019 https://orcid.org/0000-0001-7766-1198 7) Benzeşik Kağan, Doctor of Philosophy (PhD), Researcher, Assistant Doctor Scopus Author ID: 57192264535 ResearcherID: ABD-2540-2020 https://orcid.org/0000-0003-0996-5151 8) Duzbanov Birzhan Baizollaevich, metallurgical engineer https://orcid.org/0009-0002-7822-762X 9) Kamalova Aina Kamalovna, Master's degree, doctoral student https://orcid.org/0009-0005-2091-2132 10) Zhakan Armat Medetuly, Master, Doctoral Student Scopus Author ID: 57192101082 ResearcherID: GRJ-8956-2022 https://orcid.org/0009-0002-3810-0528 11) Abdulina Saule Amangeldievna, PhD, Associate Professor (docent) Scopus Author ID: 56389550800 ResearcherID: GRJ-8956-2022 https://orcid.org/0000-0001-6328-8652
List of published works	–