Project name, IRN	**AP19577218** – Research and development of highly efficient technologies for the processing of man-made waste generated during the production of chromium-containing ferroalloys
Completion date	05.01.2023-31.12.2025
Project supervisor	Sariyev Otegen, Can. Tech. Scien., associated professor
Report	Large volumes of stale mineral technogenic wastes of ferroalloy production are accumulated in slag dumps of the Aktobe ferroalloy plant - a branch of TNC Kazchrome JSC (about 15 million tons of slag of refined ferrochrome grades), the Serov ferroalloy plant (about 8 million tons of slag of refined ferrochrome grades), Klyuchevskoy ferroalloy plant (about 8 million tons of low-carbon ferrochrome slag) and Chelyabinsk Electrometallurgical Plant (9 million tons of refined ferrochrome slags, 3 million tons of high-carbon ferrochrome slags, 1 million tons of ferrosilicon and silicochrome slags, 600 thousand tons of slags ferrotungsten and 500 thousand tons of ferromolybdenum slag) [1]. The amount of waste generated is growing every year, but only a small amount is processed and recycled - about 20%, and the rest is taken to slag dumps. Therefore, reprocessing and recycling of stale slag and waste from metallurgical industries is relevant. [2]. Aktobe Ferroalloy Plant is the first metallurgical enterprise in Kazakhstan. The first ore reduction furnace of the plant was put into operation in the second half of 1942. Since that time, the ferroalloy plant has been increasing production volumes and the range of products, and production wastes such as slags of refined ferrochrome grades, dust from crushing ferroalloys and dust from dry gas cleaning have accumulated in slag storage facilities on the territory of the plant. In the early 90s, the Aktobe Ferroalloy Plant began processing existing slags from the production of ferrochrome carbon grades to obtain various grades of metal concentrate and crushed stone for construction. Stale slags of refined grades of ferrochromium cannot be processed at the operating equipment of the Aktobe Ferroalloy Plant. At present, the area of slag storage facilities is about 55 hectares. During the implementation of the project, it is planned to study in detail the structure of the slag dump, to determine by geophysical methods the storage location for slags of refined ferrochrome grades, mixed slags and the location of dry gas cleaning dust. It is also planned to study the structure of all slags, the content of useful components in them and the structure of the components by the methods of petrographic, chemical, spectral and differential thermal analysis. The mechanical and chemical properties of slags will be studied, as well as their enrichment by existing and prospective methods for extracting MFX.
Purpose	The aim of the project is to develop highly efficient technological schemes for the processing of man-made wastes of chromium-containing ferroalloys with the production of metal concentrates.

Expected results	• In the process of scientific research and implementation, formulate a process plan for the treatment of idle old ferrochrome refining slag. Recycling the accumulated waste can improve the efficiency of ferroalloy production. The introduction of high-quality raw materials is a metal concentrate with high reduced metal content and extremely low cost. It can also solve environmental problems related to the use of slag from refined ferrochrome grades in garbage dumps. Due to recycling, the area of the slag heap and the environmental pollution caused by uncontrolled dust removal are reduced. In addition, slag processing tailings can also be used in various fields such as construction and road construction. ; • The scientific research results of the project affect the progress of science, engineering and technology. This will be reflected in the production process, the participation of new sources of high-quality raw materials will improve the technical, economic and technological indicators of refined ferrochrome grade production, and improve the environmental conditions of the slag heap area.; • After the implementation of this project, consider the possibility of applying for a commercialization competition for scientific research results ; • The socio-economic effect will be to reduce social instability in industrial areas due to the creation of new employment opportunities ; • The impact on the environment is due to the recovery and disposal of old slag refined to ferrochrome grade, which reduces unwanted waste emissions. • The scientific and technological achievements aim to formulate the technology and process procedures for the treatment of aging slag of refined ferrochrome grades ; • The multiplier effect is the production of high-quality metal concentrates suitable for subsequent metallurgical processing, that is, remelted into refined ferrochrome under the conditions of the Kazakhstan ferroalloy Plant. The tailings produced after processing will be used as raw materials for the production of construction and/or chemical products. • The results of the work can be used by such enterprises as TNK Kazchrome JSC (Aktobe Ferroalloy Plant), Mechel JSC (Chelyabinsk Electrometallurgical Plant, Serov Ferroalloy Plant), Klyuchevskoy Ferroalloy Plant, Yildirm Group producing refined ferrochrome grades with a significant amount of slag.
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Publications in scientific publications	1. Sariyev O., Kelamanov B., Zhumaev A., Benzesik K. Investigation of Methods for the Utilization of Highly Basic Self-disintegrating Slags (2023) Труды университета, 3 (92), 84-88. Sariyev O., Kelamanov B., Dossekenov M., Davletova A., Kuatbay Y., Zhuniskaliyev T., Abdirashit A., Gasik M. Environmental characterization of ferrochromium production waste (refined slag) and its carbonization product (2024) Heliyon, 10 (9), art. no. e30789, DOI: 10.1016/j.heliyon.2024.e30789