Brief information about the project

Name of the project	AP14871991 “Development of energy-intensive anode materials based on conductive metal-organic frameworks (MOF) for metal-ion batteries”
Relevance	Technological advances dictate the need to improve both lithium and sodium batteries. The general point of scientific research is to find new materials for battery components, in particular, electrodes with higher energy density, long cycling capability, etc. The solution to these issues lies in the nature and structure of the materials used. A material must combine the possibility of multiple intercalation/deintercalation of metal ions without destroying the structure with maximum high capacitance and long cycling times. Obviously, a high surface area of electrode provides minimal diffusion and kinetic constraints and, consequently, high capacitance. In this regard, 3D materials have recently become popular, among which metal-organic frameworks (MOFs), which stand out for their spatial diversity. Due to their high porosity and excellent adsorption, catalytic activity, and the possibility of simultaneous implementation of different charge accumulation mechanisms, MOFs can exhibit high specific capacitance
Purpose	The aim of the project is to develop and investigate new metal-organic framework (MOF)-based anode materials with intrinsic conductivity, high specific capacitance, power, and stability. Such electrodes will serve as the basis for the creation of energy-intensive metal-ion batteries.
Objectives	Synthesis of metal-organic frameworks Mn2(DSBDC), M2(DOBDC) (M = Mg, Mn, Zn). Studying the structure and conducting cyclic voltammetric studies of synthesized compounds. Galvanostatic studies of Mn2(DSBDC), M2(DOBDC) (M = Mg, Mn, Zn).
Expected and achieved results	1) Anode materials based on metal-organic frameworks that will have a high specific capacity, power, and stability. 2) An optimized method for the synthesis of the proposed MOFs and a method for the fabrication of an anode based on them for lithium-ion and sodium-ion batteries. 3) Charge transfer mechanism in the electrode-passivation layer (SEI)-electrolyte system in the proposed MOF-based anode materials. The scientific results achieved can be used in the field of battery production, especially in the field of metal ion batteries which are much cheaper in comparison with lithium-ion batteries. Possible consumers of the results are JSC “Kazatomprom”, “Astana Solar”, which is the largest

	organization in Kazakhstan, uniting solar batteries across the country, and other organizations.
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	• Kurbatov Andrey Scopus Author ID - 15519800600, Researcher ID - M-6232-2019, ORCID - 0000-0003-1883-310X • Abdimomyn Saken Scopus Author ID - 57518892100, Researcher ID - GOW-8420-2022, ORCID - 0000-0002-5985-9050 • Zhigalenok Yaroslav Scopus Author ID - 57862139800, Researcher ID - GSC-9737-2022, ORCID - 0000-0003-1452-1248 • Kan Tatyana Scopus Author ID - 57359426400, Researcher ID - JVF-3477-2024, ORCID - 0000-0002-1222-2060 • Kiyatova Marzhan ORCID - 0000-0002-9998-8527 • Melsitova Elena • RyabichevaMargarita ORCID - 0000-0003-4160-556X • Shpigel Natanel Author ID - 56478799200, Researcher ID - HNR-0042-2023, ORCID - 0000-0003-2657-8639
List of publications with links to them	
Patents	

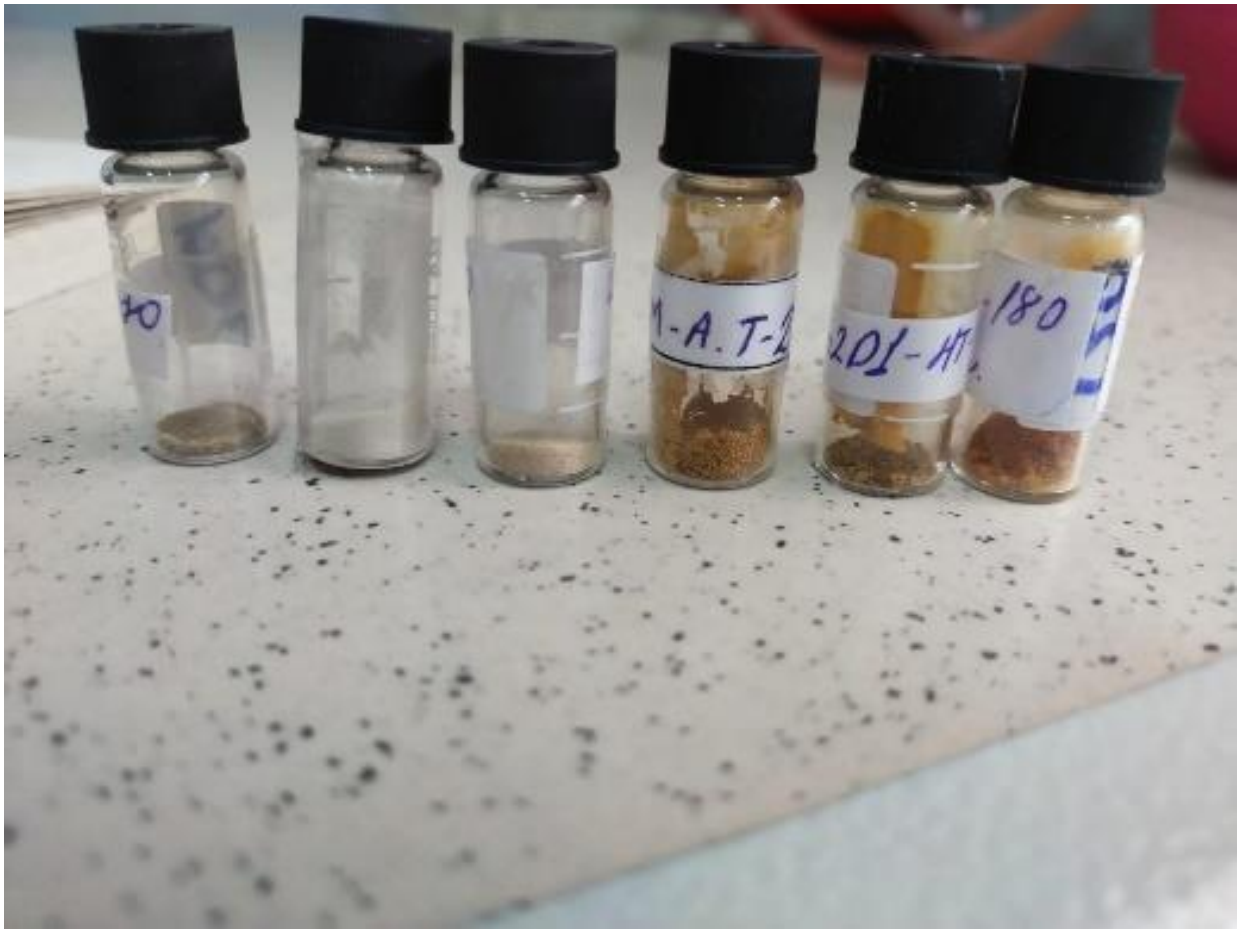

Figure 1. Obtained Zn-MOF samples

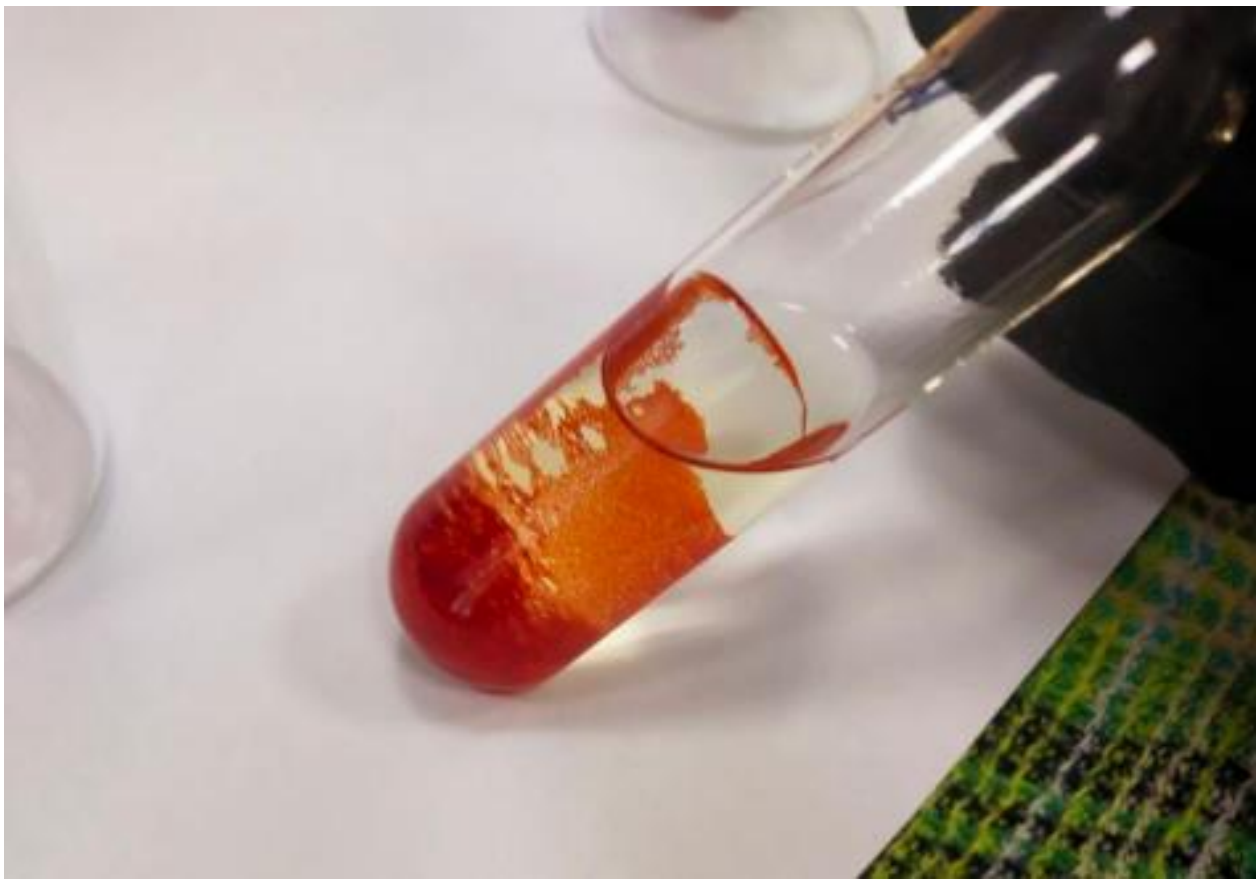

Figure 2. Obtained Mn-MOF samples