Brief information about the project

Name of the project	AP14871970 "Development of an innovative aqueous electrolyte for high-energy metal-ion batteries"
Relevance	The proposed project in the process of research in these areas proposes the use of new compositions for the formation of the solid electrolyte interface, which will protect the anode materials. In addition, it is proposed to study and control the physicochemical equilibrium in the solution, conjugated with the ionic equilibrium on the electrode surface (in terms of displacement of water molecules from the double layer because of hydration and hydrophobicity). Eventually an aqueous electrolyte stable over a wide potential range will be obtained, and a prototype battery based on it with a modified anode and a standard cathode will be created to demonstrate its cycling capability
Purpose	Managing the physicochemical equilibrium in electrolyte solutions and the design of nonequilibrium processes at the interface to expand the electrochemical stability potentials window to optimize the metal-ion batteries' operation modes.
Objectives	Development of a middle concentrated aqueous electrolyte with a self-organizing hydrophobic structure on the electrode surface Development of an innovative method of forming SEI films with hydrophobic properties on the anode surface Regulation of the electrolyte stability window using the chaotropic effect of ions and neutral molecules. The study of the dehydration process in the double layer will be carried out by electrochemical nanogravimetry using a method EQCM-D
Expected and achieved results	The main expected result of the project is the improvement of the aqueous electrolyte for the lithium- and sodium-ion battery with an extended voltage window. The focus of the development will be on the sodium-ion system, since it is more attractive for it to produce an even cheaper and safer battery primarily for alternative energy, where large storage units are required, and safety is important. The proposed improvement is based on the use of self-organizing hydrophobic layers on the electrode surface
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

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List of publications with links to them	
Patents	

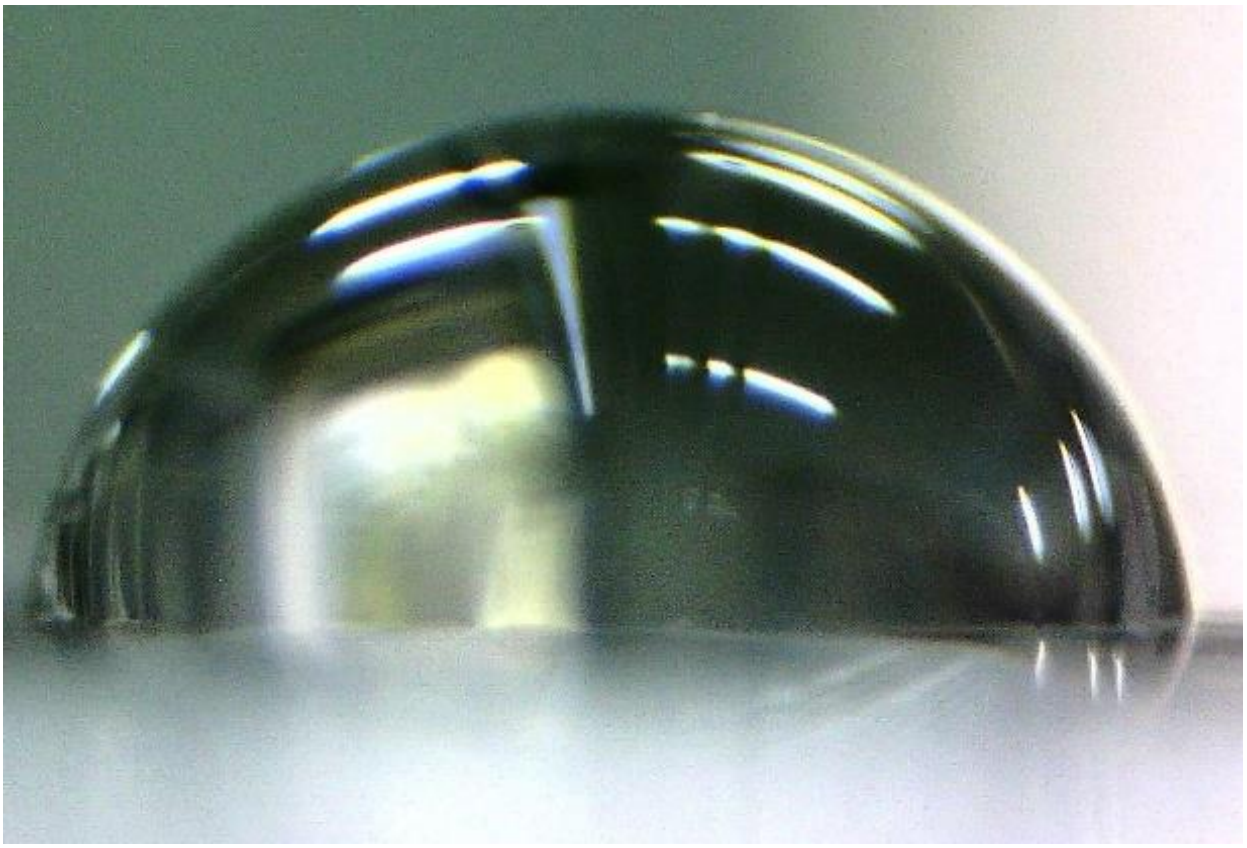

Figure 1. Contact angle measurement.

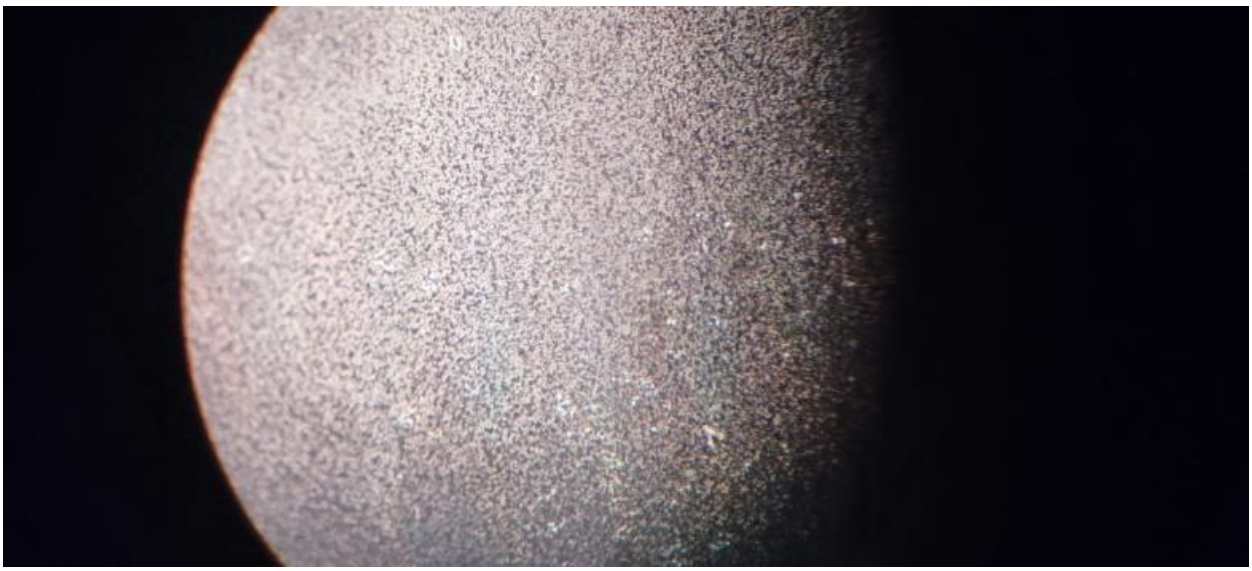

Figure 2. Coating of PVDF

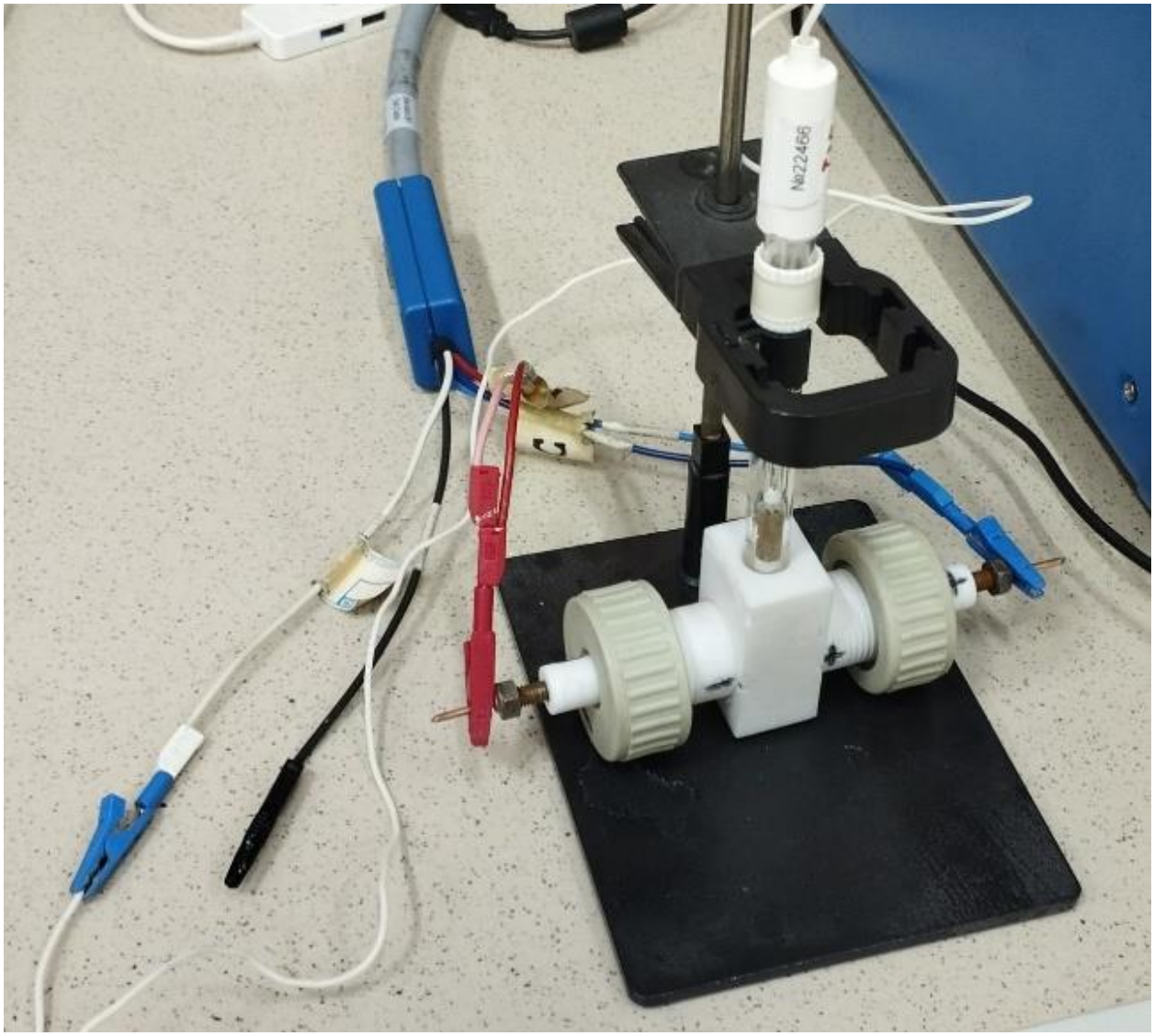

Figure 3. A cell for electrochemical measurements