

Brief information about the project

Name of the project	IRN AP26100661 "Synthesis, characterization, and evaluation of novel anthracenyl-functionalized TPA-mono-, bis-(thienothiophene), and tetrathienoacene metal-free organic dyes: multifunctional applications in dye-sensitized solar cells, energy storage devices, and supercapacitors"
Relevance	The relevance of this study stems from the need to develop and scale up sustainable, clean energy sources and related technologies, which is now recognized worldwide as an urgent task. Most renewable clean energy sources are highly dependent on the time of day and regional weather conditions. Therefore, the efficient use of these intermittent energy sources requires the development of appropriate energy conversion and storage devices.
Purpose	synthesize new metal-free organic compounds that can effectively function as energy storage devices and dyes for solar photovoltaic cells
Objectives	1) Synthesize new sets of metal-free organic compounds with improved π-donor and acceptor functionalities to enhance energy storage and conversion efficiency; 2) Explore the potential use of the synthesized compounds as dyes in dye-sensitized solar cells (DSSCs); 3) Conduct a detailed evaluation of the electrochemical properties of the synthesized compounds, including their ability to function as components of energy storage devices and supercapacitors.
Expected and achieved results	1) New sets of metal-free organic compounds with improved π-donor and acceptor functionalities will be synthesized to enhance energy storage and conversion efficiency; 2) The potential use of the synthesized compounds as dyes in dye-sensitized solar cells (DSSCs) will be explored; 3) A detailed evaluation of the electrochemical properties of the synthesized compounds, including their ability to function as components of energy storage devices and supercapacitors, will be conducted.
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	Maxim Sergeevich Lepikhin Web of Science Researcher ID: LMN-3671-2024 ORCID: 0009-0006-7361-0135 Scopus Author ID: 56436632000 Adewale Olufunsho Adeloye Web of Science Researcher ID: I-6046-2019 ORCID: 0000-0003-1736-5738 Scopus ID: 36597865700 Dinara Aktaykyzy Abduakhytova Web of Science Researcher ID: GYA-5917-2022 ORCID: 0000-0002-4316-0755 Scopus ID: 57344630000

	Azhar Aidarovna Atchabarova Web of Science Researcher ID: D-3857-2015 ORCID: 0000-0002-4600-2728 Scopus ID: 56998822600 Amina Moldabekovna Abdullanova Anvar Rakhimovich Ishkenov Rustam Rishatovich Tokpayev
Usage	The synthesis and use of new organic dyes in solar cells will improve their efficiency and reduce their cost. The development of these systems will allow regions, particularly remote and resource-poor ones, to utilize local renewable energy sources to increase energy independence. The fundamental and practical knowledge gained will enable further research to address pressing energy challenges. These initiatives can significantly contribute to sustainable development and improved quality of life, as well as support scientific and technological progress in the field of renewable energy.
Priority compared to real-world alternatives	
List of publications with links to them	
Patents	