Brief information about the project

Title	IRN AP25796519 «Development of TiO_2-based semiconductor nanopowders for photocatalytic degradation of organic pollutants under visible light»
Relevance	The development of photocatalytic technologies is attracting increasing interest due to the growing need for new methods of environmental purification. TiO_2-based photocatalysts doped with iron, obtained by calcination of MIL-125, hold great promise for the efficient degradation of organic pollutants under visible or solar light, which reduces energy consumption and helps to better understand the nature of the doped material formation.
Objective	To develop semiconductor materials based on TiO_2 nanopowders operating in the visible light region, obtained by calcining doped metal-organic frameworks MIL-125.
Tasks	• Task 1. Obtaining metal-organic frameworks MIL-125 by the solvothermal method. • Task 2. Study of the thermal decomposition of MOF to obtain TiO_2 doped with Fe. • Task 3. Effect of heat treatment on morphology and phase composition. • Task 4. Determining the optimal concentration of doping or obtaining heterostructured photocatalysts based on Fe^{3+} and TiO_2 • Task 5. Determination of electrical and electronic properties. • Task 6. Evaluation of photocatalytic activity of materials • Task 7. Determination of the presence of active particles during the decomposition of dyes • Task 8. Study of photostability and photoaging of the material. • Task 9. Adsorption properties and surface bonds

Expected and achieved results	• The project is expected to develop and produce photocatalytic nanopowders based on iron-doped titanium dioxide (TiO_2) obtained from a metal-organic framework MIL-125, which will demonstrate high photocatalytic activity under the influence of visible light. • The final product will be characterized by XRD, SEM, FT-IR and BET spectroscopy. • The optical and photoelectric properties of iron-doped TiO_2 nanopowders will be determined. • The active species present in the decomposition reactions will be determined.
The names and surnames of the members of the research group with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to the relevant profiles	Uralbekov Bolat Muratovich, PhD, Professor at the Department of General and Inorganic Chemistry, al-Farabi Kazakh National University. Profile Links: ORCID: http://orcid.org/0000-0002-3245-4096, Scopus: Scopus Author ID: 36664090200
List of publications with links to them (by direction)	• Orazov, Z., Tulebekov, Y., Bakhadur, A., & Uralbekov, B. (2023). Kinetic model of photocatalytic oxidation of dye (Orange II) by superoxide radicals. Chemical Bulletin of Kazakh National University, 110(4). (WoS: Q4, индекс цитирования: 1). DOI: https://doi.org/10.15328/cb1345 • Tulebekov, Y., Orazov, Z., Satybaldiyev, B., Snow, D. D., Schneider, R., & Uralbekov, B. (2023). Reaction Steps in Heterogeneous Photocatalytic Oxidation of Toluene in Gas Phase—A Review. Molecules, 28(18), 6451. (Процентиль: 68, индекс цитирования: 8). DOI: https://doi.org/10.3390/molecules28186451
Information about patents	