

The project focuses on exploring new solutions in photovoltaics – a technology that converts sunlight into electricity. Current solar cells have limited efficiency and durability, which is why we aim to create devices that can fully harness the potential of solar energy. The goal of the research is to develop innovative solar cells based on indium gallium nitride (InGaN) and on their combination with halide perovskites in the form of tandem cells.

The research will include the fabrication and improvement of special InGaN layers with high indium content, followed by the construction of the first prototypes of single-junction solar cells made from this material. At the same time, the project plans to develop entirely new InGaN–perovskite tandems, in which both materials complement each other – InGaN efficiently absorbs high-energy light, while perovskites make use of the lower-energy part of the spectrum. Such a combination allows the efficiency of the devices to exceed the theoretical limits of conventional solar cells.

This research direction is undertaken because InGaN is one of the few materials capable of covering nearly the entire solar spectrum and operating under harsh conditions, while perovskites offer high efficiency and a simple fabrication process. Combining their advantages opens the way to breakthrough solutions in renewable energy.

The main expected outcomes of the project include: developing new methods for producing InGaN layers, building the first prototypes of InGaN solar cells, constructing pioneering InGaN–perovskite tandems, and gaining new insights into the properties of these materials. In the longer term, the research may contribute to the creation of stable and highly efficient solar panels, which could become a key element of the energy transition.