Title: Construction and optimization of nitride and tandem nitride-perovskite solar cells

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Institute: Institute of High Pressure Physics PAS

Unit: Laboratory of Semiconductor Characterization (NL-12)

Background:

The aim of the research is to develop innovative solar cells based on indium gallium nitride (InGaN) and on their combination with perovskite halides in the form of tandem cells. The research will involve the fabrication and refinement of special InGaN layers with a high indium content, followed by the construction of the first prototypes of single-junction solar cells made from this material. In parallel, the construction of entirely new InGaN–perovskite tandems is planned, in which the two materials complement each other – InGaN effectively absorbs higher-energy light, whilst perovskites utilise light from the lower part of the spectrum. This combination allows the efficiency of the devices to be increased beyond the theoretical limits of conventional cells.

InGaN is one of the few materials capable of covering almost the entire solar spectrum and operating in harsh conditions, whilst perovskites offer high efficiency and simple manufacturing technology. Combining their advantages paves the way for groundbreaking solutions in renewable energy.

The key expected outcomes of the project are: the development of new methods for producing InGaN layers, the construction of the first InGaN cell prototypes, the fabrication of pioneering InGaN–perovskite tandems, and the acquisition of new knowledge about the properties of these materials. In the longer term, the research may contribute to the development of stable and highly efficient solar panels, which will become a key element of the energy transition.

Aim of the project

1. Growth and optimization of InGaN pseudosubstrates,
2. Fabrication of solar cells based on InGaN pseudosubstrates,
3. Construction of tandem solar cells combining InGaN and lead halide perovskites.

Requirements:

- A master's degree in physics, materials engineering or chemistry,
- Fluency in spoken and written English.