

ITEM-SOLAR

Lide Yao

In-situ transmission electron microscopy for the characterization of next generation solar cells

WHAT AND WHY?

Solar cells based on perovskite materials are efficient and can be produced at low cost, but their commercialization is hampered by insufficient stability and durability caused by atomic-scale physical and chemical processes. To address these issues, we have developed a high-resolution transmission electron microscopy (TEM) technique enabling in-situ structural imaging and photovoltaic characterization.

HOW AND WITH WHOM?

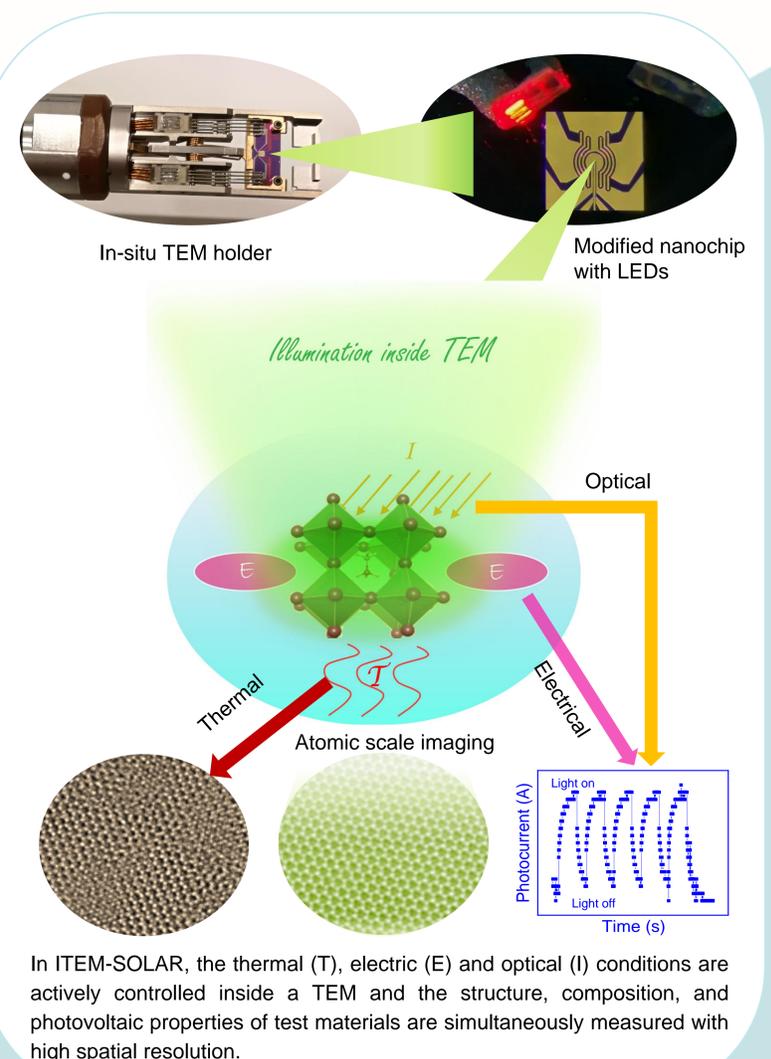
We designed a new TEM sample holder with integrated light-emitting diodes (LEDs) at the Nanomicroscopy Center of Aalto University. Two PhD students and a postdoctoral researcher contributed to the optimization of a new sample preparation processes for the new TEM holder and test measurements on perovskite and 2D optoelectronic materials under various electrical, heating, and photovoltaic conditions. Relevant materials for this project were provided by Prof. Qingfeng Dong's group at Jilin University in China. On 2D materials, we collaborated with Prof. Zhipei Sun's group at Aalto University.

RESULTS, IMPACT AND RECOMMENDATIONS

A new in-situ TEM measurement platform enabling simultaneous high-resolution structural imaging and characterization of thermal, electrical, and photovoltaic properties was successfully established. This is the first of its kind in Finland. Initial results with this new characterization technique are now being summarized for publication. The platform is available to research groups and companies working on photovoltaics and other optoelectronic devices and, thus, will actively contribute to the development of next-generation solar cells.

What next?

In the future we will collaborate with other groups and companies on the characterization of perovskite solar cells and other optoelectronic devices. This is expected to drive new technologies or lead to high-impact open-access publications. We will also seek funding to fund collaborations on in-situ transmission electron microscopy



More information:

Dr. Lide Yao
NanoSpin, Department of Applied
Physics, Aalto University, Finland
lide.yao@aalto.fi

Partners:

Prof. Qingfeng Dong
State Key Laboratory of Supramolecular
Structure and Materials, Jilin University, China