Description of Funded Research Projects
1st Call for H.F.R.I. Research Projects to support Post-Doctoral Researchers

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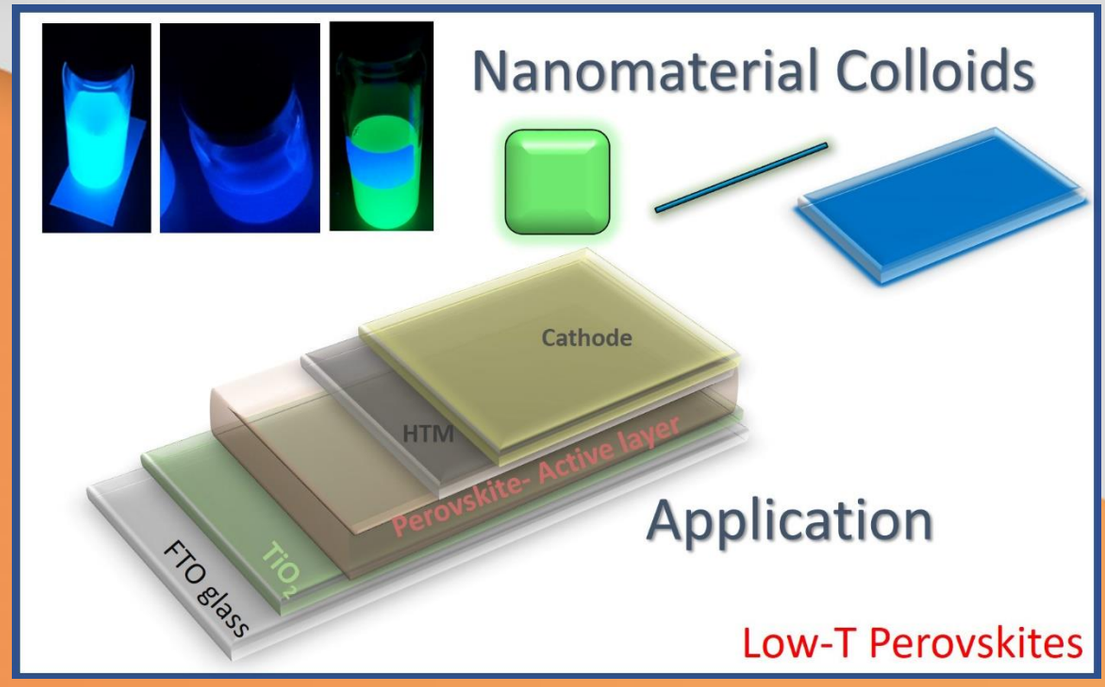
Research Project Title:

Low-Temperature Growth of Perovskite Nanosystems for High-Performance Perovskite Solar Cells

Principal Investigator:

Athanasia Kostopoulou



Popular Title:

New Nanomaterials for High-Performance Perovskite Solar Cells

Scientific Field:

Engineering and Technological sciences/Nanotechnology

Host Institution:

Foundation for Research & Technology - Hellas (FORTH)

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Photovoltaic is the most promising technology of converting solar energy to useful electrical power. The need for materials of lower production cost than those commercially available has led to new photovoltaic technologies. In less than five years, the perovskite solar cells have been considered a promising photovoltaic technology due to the unprecedented rise of their power conversion (from 3.8 to 20 %) similar to that observed for the rest of photovoltaic devices after decades of research effort. The light-harvesting active material for these solar cells is a perovskite, namely a semiconductor of the AMX3 type, where A is a cation (organic or inorganic), M a heavy atom (cation) such as Pb or Sn and X a halide atom (Cl, Br, I). Although hybrid perovskite solar cells exhibit quite high efficiencies, the perovskite absorber layers exhibit compositional degradation due to both heat and humidity, affecting the long-term stability of the photovoltaic devices.

According to these requirements, the main objective of the LowT-Perovskites project is to design and develop new, alternative and stable all-inorganic perovskite colloidal materials, for perovskite solar cells of enhanced efficiency. The realization of this proposal requires viable methodologies to produce materials of high quality and long-term stability together with the simple and flexible manufacturing of devices with controllable physical, chemical, optical and electronic characteristics. In order to produce these high-quality materials, two methodologies (based on wet-chemistry and photo-induced procedures) have been carefully selected. These methodologies observe the following important requirements: i) easy procedures at low temperature (LT), ii) non-usage of complex equipment (Schleck lines) or inert gas flow during synthesis, iii) rapid and cost-efficient, iv) reproducibility, v) product quality/homogeneity, and vi) easily tunable morphology and phase. For these reasons, an interdisciplinary research team including scientists from physics, materials science and engineering is required.

Project Impact on Society

Our cutting-edge research focuses on boosting solar cell conversion efficiencies, lowering the cost of solar cells. The high efficiency together with the cost-effectiveness and degradation stability of proposed materials, could potentially provide a promising technology that is economically viable for commercialization, with an obvious environmental and socio-economic impact. Additionally, the need for mass production of photovoltaic systems requires rapid and low-cost material synthesis protocols. This proposal is based on a large number of colloidal products through simple, rapid and cheap methods. At the end of this project, not only will we be in the position to deliver innovative solar cell devices, but we will have developed the fundamental platform for electrically and optically addressed nanomaterials of high efficiency, for many other applications.

Such findings in national level, support opportunities for high quality research in our country. Young scientists could stay and contribute to its development through their research innovation.

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To me, H.F.R.I. funding would mean...

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I stayed in my country in a difficult period and did not regret it. Young researchers went abroad but some chose to stay, facing difficult working conditions. Many times, they remained unpaid or captive in an insecure regime. Laboratories were underfunded, thus having negative impact on their research. These difficult conditions were not considered in their research evaluation, their quality of research should be comparable to that of researchers in well-equipped and well-funded laboratories. Finally, their research quality was considered equal and even advanced on many occasions. It is crucial nowadays, that an opportunity is being given to the young researcher through these programs, to submit proposals which will be evaluated on the basis of their excellence, their scientific and social impact. The job security offered is very important in order to work focused, in a productive way, but also to develop new skills through collaborations, as well as economic/scientific managerial skills as project coordinator.

The Principal Investigator,

Athanasia Kostopoulou

Funding

Amount: **179,975 €**

Duration: **36 months**

Foundation: **H.F.R.I.**

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