Characterization of defective states in hybrid Perovskite thin films for radiation sensor applications.

Are you interested in conducting advanced physics research on a very innovative thin film material? We are looking for motivated and skilled PhD and post-doctoral researchers to work on the physics of perovskites thin films.

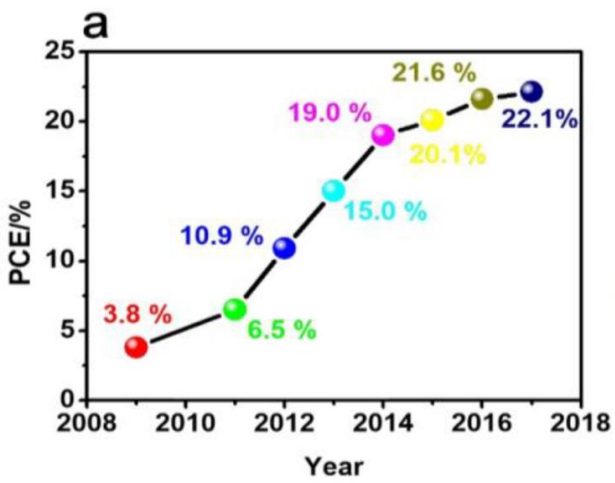

Figure 1. *Power conversion efficiency of perovskite solar cells over the year, extracted from Y Wu et al Nanomaterials 2018, 8(6), 356; https://doi.org/10.3390/nano8060356*

In the last decades, the evolution of real-time medical diagnostic tools, such as computer tomography from radiography based on photographic plates was enabled by the development of integrated solid-state radiation detectors made from conventional solid-state semiconductors. Recently, solution-processed organic and hybrid semiconductors have attracted a great deal of attention for the development of optoelectronic devices operating in the visible and near-infrared spectral regions, such as solar cells (fig1), radiation sensors, light emitting devices. Such inexpensive semiconductors have been recently demonstrated high sensitivity for the sensitive detection of ionizing radiation [1-2].

The Post-doc position research activity will be carried out in the framework of a European POR-FESR Project "Flexible, large-area patches for real-time detection of ionizing radiation, *FORTRESS*". The FORTRESS research activity is focused on the development of ionizing radiation detectors based on perovskite thin films for applications in real-time control and risk reduction associated with medical diagnostics and radiotherapy treatments. In particular, methylammonium lead iodide perovskite (CH3NH3PbI3) has recently demonstrated to be a very interesting material applications in solar cells and radiation sensors [3,4]. Notwithstanding these encouraging results in applications, perovskites still suffer from stability problems when used as transport layer in thin film solar cells, and one of the possible causes of the stability issue should be found in defect states [5,6].

The post-doc research activity **is focused on monitoring defect states and compositional changes of the perovskite layers. The analyses will be carried out by electrical and optical characterization methods (temperature dependent current-voltage and capacitance voltage analyses), charge spectroscopy techniques (Deep Level Transient Spectroscopy, Photo induced transient spectroscopy) and Surface Photovoltage Spectroscopy.**

This study will focus on the investigation of the correlation between the defect states and the electrical performance of the semiconductor, which is related to the performance of the final devices. The results obtained will be fundamental for the overall understanding of physics of thin film perovskites, as well as for the development of advanced perovskites radiation sensors.

Applications are invited for those, physicists, engineers, material scientists, nanotechnologists and chemists with expertise in perovskites thin film and defect studies, seeking to work in this exciting field for the 2-year research project.

For applicants interested in the above research project, please get in touch for more information, sending also a copy of your CV to Prof. Daniela Cavalcoli, Physics and Astronomy Dept University of Bologna, Daniela.cavalcoli@unibo.it .

call for applications:

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follow: "Filtra per Dipartimento" and select: "*Centro interdipartimentale di ricerca industriale meccanica avanzata e materiali"*

The research activity will be carried out at the CIRI-MAM (*Centro interdipartimentale di ricerca industriale meccanica avanzata e materiali) section at the Physics and Astronomy Dept University of Bologna, Semiconductor Physics Group:*

https://site.unibo.it/semiconductor-physics/en

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