SUSTAINABLE MATERIALS, PROCESSES AND SYSTEMS FOR ENERGY TRANSITION

MUR DM 118 - Innovative and sustainable semiconducting materials for ionizing radiation detection

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] ALMA MATER STUDIORUM UNIVERSITA' DI BOLOGNA [P.iva/CF:01131710376]
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Context of the research activity	The proposed activity will include the study and development of detectors of ionizing radiation based on innovative semiconductors that can be processed from the liquid phase, such as organic semiconductors and hybrid (organic-inorganic) perovskites. The possibility of processing these materials as inks allows the manufacture of electronic devices over a large areas, using low-cost and low-temperature (<150°C) printing techniques, with a consequent reduced energy impact. The opto-electronic properties of this class of materials are versatile thanks to the ease of chemical synthesis, which also offers the possibility of lowering their level of toxicity, for example by eliminating the presence of lead, typical of perovskites. The bio-compatibility of many organic semiconductors is known as well, to explore the application of detection sensors as wearable dosimeters in direct contact with human tissues. The research topic, although focused on the physics of electronic transport and detection in organic-hybrid semiconductor materials, has a strongly interdisciplinary character, embracing different scientific fields such as materials science, electronic engineering and medical physics. It also adheres to the PNRR themes of Key Digital Technologies (smart solutions for healthcare) and the Sustainable Blue Economy. Progetto finanziato nell'ambito del PNRR – DM 118/2023 - CUP E14D23001840006
Objectives	Progetto finanziato nell'ambito del PNRR – DM 118/2023 - CUP E14D23001840006 Main seat to carry out research: Department of Physics and Astronomy, University of Bologna, Bologna, Italy Scientific Responsible: Laura Basiricò, University of Bologna,

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Skills and competencies for the development of the activity	The activity of the PhD student will include the fabrication of the detectors through lithographic processes and printing techniques of the active layer, the testing of the detectors at irradiation facilities and national and international research centres (ELETTRA synchrotrons - Trieste - Italy, and ESRF – Grenoble - France, proton irradiation centres such as GSI, Darmstadt, Germany and TIFPA, Trento Institute for Fundamental Physics and Applications, Trento, Italy). The final goal is the understanding of the microscopic mechanisms that regulate the detection of ionizing radiation in organic-hybrid semiconductors, which will lead to the definition of functionalization strategies of the same to maximize the detection performance. The doctorate will include a period of activity abroad of 6 months