UNIVERSITÀ DI PARMA

Seminar:

Recent developments in organic photodetectors and bioelectronics

Monday 23/02/2026 at 10:30 in Centro Sant'Elisabetta

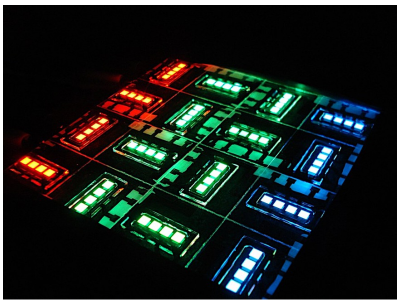
Prof. Karl Leo - Technische Universität Dresden (Germany)

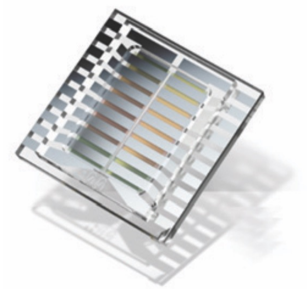
Link Teams

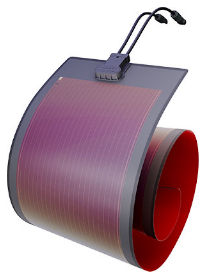
Organic semiconductors offer unique advantages - mechanical flexibility, biocompatibility, low-cost processing, and tunable optoelectronic properties - making them ideal for next-generation photodetectors and bioelectronic devices. Recent advances have enabled organic photodetectors (OPDs) with performance metrics approaching those of established inorganic technologies.

Through molecular design, exciton dynamics, and refined device architectures, OPDs now demonstrate low dark currents, high specific detectivity, fast temporal response, and tunable spectral sensitivity from the visible to the near-infrared. Techniques such as photomultiplication provide high gain, while low-donor-content architectures and trap management reduce noise and dark currents, facilitating filterless spectral selectivity. Semitransparent, flexible OPDs processed via physical vapor deposition expand possibilities for large-area sensors in NIR communication, imaging, and spectroscopic sensing.

Beyond classical optoelectronic applications, organic materials are advancing in bioelectronic as wearable and implantable systems. Their mechanical compliance and tunable conductivity facilitate seamless interfacing with biological tissues for real-time health monitoring, biosensing, and therapeutics. Advances encompass organic thin-film transistors, sensors, and light-emitting components integrated into conformable wearables for pulse oximetry, biometric detection, and continuous physiological tracking.







Karl Leo is Professor of Optoelectronics at TU Dresden, where he heads the Institute of Applied Physics and directs the Dresden Integrated Center for Applied Physics and Photonic Materials (IAPP).

His groundbreaking work includes early observations of coherent electronic dynamics in semiconductors, controlled doping in organic devices, and world-record efficiencies in OLEDs and organic solar cells. These innovations have resulted in about 60 patent families, and enabled the co-founding of 8 companies, like Novaled and Heliatek.

Prof. Leo's exceptional impact has been recognized with numerous prestigious honors, including the Leibniz Prize (2002), and the European Inventor Award (2021) from the European Patent Office.

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