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ABSTRACT:

Organic and hybrid nanomaterials as a truly multifunctional platform: from light generation to cell interfacing and x-ray detection

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The combination of organic and hybrid nanomaterials as functional layers of planar and vertical device architectures enables the development of devices for a variety of applications, including light generation, cell interfacing and x-ray detection.
Electroluminescence generation from organic materials impacts a number of organic photonics applications including display technology and bio-sensing. Here we discuss the concept of Organic Light-Emitting Transistors (OLETs), highlight their specific electrical, optoelectronic and photonic characteristics with respect to the well-established OLED technology, and discuss their potential for practical applications.
We further explore advanced nanomaterials and devices to stimulate and transduce the bioelectrical activity of neural cells. In particular, we show that transparent silicon-free transistor structures based on organic semiconductors are fully biocompatible and provides bidirectional stimulation and recording of primary neurons and astrocytes.
We finally show how the integration of hybrid perovskite and organic thin films used as active layer and functional interlayers, respectively, allows the development of air-stable, solution processed and flexible X-ray detectors that are relevant for a variety of fields, such as health, agrifood and manufacturing.