Advancements in Organic Functional Electronics: Innovations in Imaging and Energy Harvesting Devices

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In recent research, we've highlighted the potential of organic up-conversion imagers, combining organic infrared photodetectors and organic light-emitting diodes (OLEDs), as promising tools for visualizing infrared images. This concept gained attention from NATURE's research highlight, being noted as an anti-surveillance device capable of detecting invisible signals [**Nature**, *617* (2023) 227]. Our previous work showcased a device with a turn-on voltage below 1.7 V, producing high-quality images exceeding 1500 ppi resolution, as detailed in Nano Energy [**Nano Energy**, *86* (2021) 106043]. Additionally, the device maintained over 65% visible transparency, detected infrared intensity below 1 μW/cm^2, and offered a linear dynamic range exceeding 80 dB, as outlined in Science Advances [**Sci. Adv.**, *9* (2023) eadd7526]. Expanding on this, we introduced a novel device configuration with a charge generation layer linking two OLED display units, achieving an upconversion efficiency of over 30%, as reported in Advanced Science [**Adv. Sci.**, *10* (2023) 2302631]. Furthermore, Advanced Functional Materials [**Adv. Funct. Mater.**, *34* (2024) 2309589] recently accepted an all-solution process for developing organic imagers, featuring Zn-doped $CsPbBr_3$ quantum dots.

Concerning energy harvesting, we proposed transparent organic solar cells with transmittance exceeding 75% to capture UV/NIR light from ambient conditions. Such cells could replace a watch's cover glass to harness free power from ambient light. Additionally, vacuum-deposited perovskite solar cells show promise in capturing weak indoor light. I intend to delve deeper into our research experiences, perspectives, and device design strategies during my presentation. If possible, I also look forward to engaging in constructive dialogue with our audience, enriching our collective understanding of the fundamental concepts and design principles behind organic imagers and energy harvesting applications.