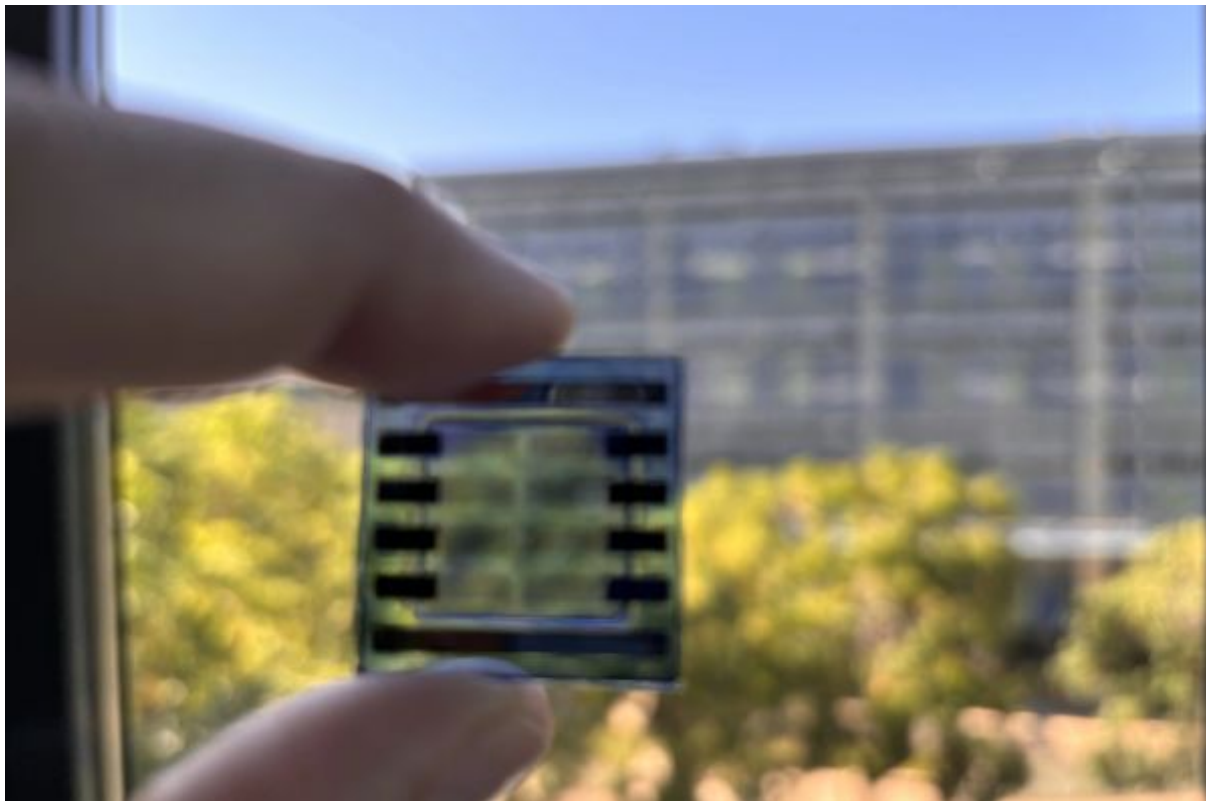




New transparent solar cells offer efficient energy conversion at large angles

Researchers have developed a cutting-edge organic solar cell technology that combines high efficiency and transparency, potentially transforming the future of energy generation in urban environments and electric vehicles. The cells achieve 50% visible light transparency and 9.8% efficiency in converting sunlight to electricity, even at oblique angles.

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A groundbreaking innovation in solar energy technology has been achieved with the development of **new organic photovoltaic (OPV) cells that are both highly transparent and efficient**. ICFO researchers **Dr. Quan Liu, Dr. Luis G. Gerling, Francisco Bernal-Texca, Dr. Johann Toudert**, led by **UPC and ICFO Professor Dr. Jordi Martorell**, together with Peking University, have created solar cells that convert sunlight into electricity with 9.8% efficiency while maintaining 50% visible light transparency, making them ideal for integration into

windows and building facades. The article has been published in *Advanced Energy Materials*. The newly developed OPV cells achieve a balance between visibility and energy conversion. Thanks to their high degree of transparency and their ability to maintain high efficiency levels throughout the day, they could be integrated into windows and other surfaces without significantly obstructing the view or altering the appearance. This makes them suitable for urban environments, where building-integrated photovoltaics can harness solar energy without compromising the aesthetic or functional aspects of windows and other transparent surfaces.

These OPV cells perform exceptionally well even when sunlight strikes them at oblique angles. Traditional solar cells often lose efficiency when the sun isn't directly overhead, but the new design incorporates a 1D nanophotonic structure that decouples light harvesting from its transmission. This way, the cells can effectively capture and convert sunlight from a wide range of angles (up to 50 degrees), making them much more suitable for vertical installations, such as building facades.

Moreover, the technology shows promise for applications beyond buildings, such as for electric vehicles, where surfaces are often positioned at varying angles to the sun. Thus, the reported strategy could turn automobiles' transparent surfaces to solar energy collectors. Overall, this development marks a significant step forward in solar technology, promising not only to improve energy efficiency but also to expand the versatility and applicability of solar cells in everyday environments. In the long-term picture, OPVs could revolutionize how we think about energy generation in various sectors, providing a sustainable solution to the growing energy needs of modern society.

Bibliographic reference:

Liu, Quan & Gerling, Luis & Texca, Francisco & Toudert, Johann & Li, Tengfei & Zhan, Xiaowei & Martorell, Jordi. Light Harvesting at Oblique Incidence Decoupled from Transmission in Organic Solar Cells Exhibiting 9.8% Efficiency and 50% Visible Light Transparency. *Advanced Energy Materials*. 10. (2020) 10.1002/aenm.201904196.

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