

Hybrid Graphene-Quantum Dot Phototransistors with Ultrahigh Gain

ICFO research groups report in Nature Nanotechnology on photodetection advances combining nanocrystals and graphene.

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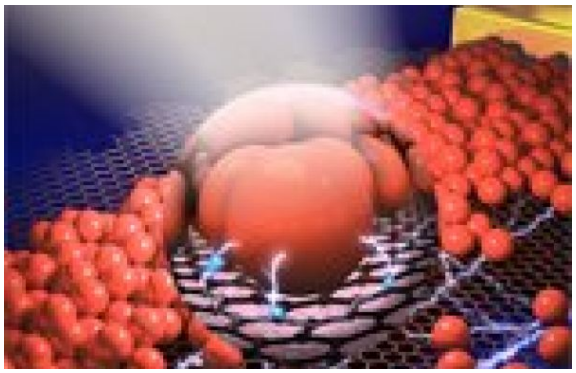
The research groups at ICFO led by Professors Gerasimos Konstantatos and Frank Koppens, both NEST Fellows, announce in Nature Nanotechnology the development of a novel hybrid photodetector that is ultra-sensitive to visible and infrared light. The device is made of graphene, an ultra-thin, flexible conductor of electricity, and nanocrystals (colloidal quantum dots), semi-conducting nanomaterials which can be tuned to absorb a wide range of wavelengths. This graphene-nanocrystal combination has led to the production of a device which is a billion times more sensitive than existing graphene photodetectors to date.

This discovery will have far reaching implications in the development of ultra-sensitive, low-cost photodetectors with a wide range of imaging applications, including biomedical imaging and night vision, as well as remote sensing and metrology. The reported hybrid

device consists of low-cost materials that can be integrated with existing silicon technologies, and can be readily deposited onto any sort of substrates- rigid or flexible, crystalline or amorphous. The search for low-cost, ultra-sensitive photodetectors, in particular for light that is not visible with the naked eye (such as infrared light) has been a pressing challenge for physicists and engineers.



Artistic representation of the device consisting of graphene with quantum dots on top



Thesis Committee