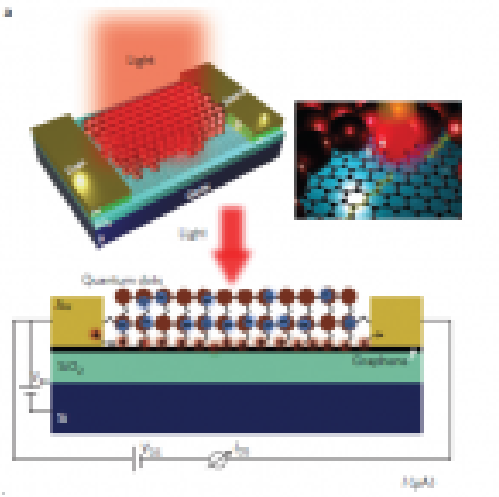
Hybrid graphene–quantum dot phototransistors with ultrahigh gain



Graphene is an attractive material for optoelectronics1 and photodetection applications2–6 because it offers a broad spectral
bandwidth and fast response times. However, weak light absorption and the absence of a gain mechanism that can generate
multiple charge carriers from one incident photon have limited the responsivity of graphene-based photodetectors to ~1022 AW21. Here, this group demonstrate a gain of ~108 electrons
per photon and a responsivity of~107 AW21 in a hybrid photodetector
that consists of monolayer or bilayer graphene covered with a thin film of colloidal quantum dots. Strong and tunable light absorption in the quantum-dot layer creates electric charges that are transferred to the graphene, where they recirculate many times due to the high charge mobility of graphene and long trapped-charge lifetimes in the quantumdot layer. The device, with a specific detectivity of 731013

Jones, benefits from gate-tunable sensitivity and speed, spectral selectivity from the short-wavelength infrared to the visible, and compatibility with current circuit technologies.

more information: Gerasimos Konstantatos *et al.* *nature nanotechnology*, DOI: 10.1038/NNANO.2012.60.