Towards Sustainable Fabrication of hybrid Graphene-QD Photodetectors by Laser Transfer Techniques

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Abstract

Nanoelectronic device processing holds great promise for a continual technological progress and prosper economic development. Complementary to that, a positive impact of the field may be achieved by the adoption of sustainable nanomaterials processing methods that would not compromise device performance or the environment. To that end, hybrid graphene-quantum dots (QDs) photodetectors are known for their enhanced responsivity over the QDs absorption spectral range. However, typically this advantage comes at the cost of long response time, leading to one of the main challenges of graphene photodetectors.
Here we report on a hybrid graphene-$Bi_2Se_{(3-x)}S_x$ QDs photodetector fabricated by a laser transfer technique, necessitating the use of commonly involved chemicals and solvents in standard processing techniques. The laser-processed devices present an improved response time in the range of μ-sec and a high responsivity in the visible to near infrared spectral range, attributed to the cleanliness and quality of the interface of graphene with the QDs.

Figures

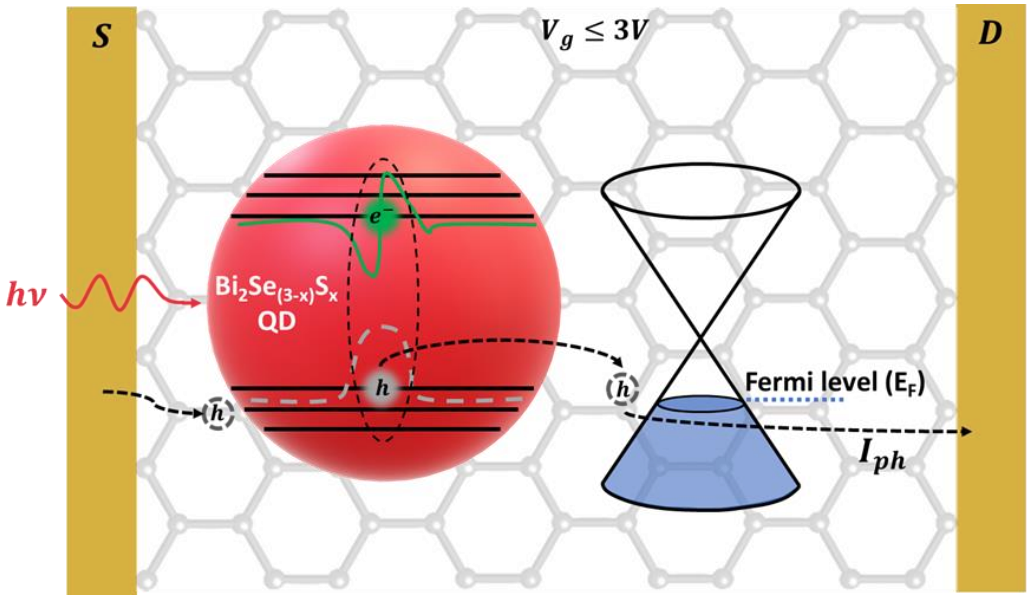

Figure 1: Schematic illustration of the photodetector gain mechanism.