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Charge Transfer from Lead Sulfide Quantum Dots to MoS_2 Nanoplatelets*

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The research interest in the transition metal dichalcogenides (TMD) has been reborn a few years ago. This had happened due to the remarkable properties of monolayered TMD (e. g. high carrier mobility and high exciton binding energy) and due to the development of the exfoliation methods. Photoconductive MoS_2-based devices spectral range can be expanded to the NIR by coupling them with PbS QDs. However, this requires extensive knowledge about the the charge and energy transfer processes in such systems. In this paper, we investigate charge transfer between PbS QDs and MoS_2 nanoplatelets (NPls). Using the PL decay analysis, we show how the charge transfer efficiency changes with the distance between the QDs and NPls, as well as with QD size. Last, we demonstrate that the addition of the MoS_2 NPLs increases the photoconductive response for up to an order of magnitude, as compared to the bare QD.

Keywords: transition metal dichalcogenides, quantum dots, charge transfer, lead sulfide, molybdenum disulfide.

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