Quantum Dot Nanocrystals for Renewable Energy and Optical Applications

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Quantum dots are a new class of nanocrystals through which quantum confinement phenomena could be utilized to enable flexible tailoring of absorption or photoluminescence optical properties ranging from ultraviolet to infrared. Such tunable nanomaterials offer great potential to enhance the efficiency of opto-electronic energy devices such as solid-state lighting and solar cells.

This work is to understand the nanocrystal growth during chemical synthesis and the engineering strategies (through surface/ligand modification and thermal processing) to enhance the photoluminecent quantum yield. In addition, we will present the opportunity of nanocrystals and derived materials for optical management, controlling the light absorption (optical filters) and photoluminescence (wavelength shifters). A case is made for nuclear detector application to achieve real-time discrimination of neutron and gamma rays.