CoffeeTalk@ISOF

CdSe Quantum Dots endowed with a thermally activated delayed luminescence as result of reversible electronic energy transfer

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Quantum dots (QDs) are nanostructured materials with unique photophysical properties compared to their parent-bulk materials [1,2] such as a broad band absorption spectrum with very high absorption cross section, a sharp Gaussian like emission band together with a high luminescence quantum yield and a relatively longer luminescence lifetimes compared to the classical fluorophores [3]. Since last few years, inorganic quantum dot–organic chromophore nanohybrids have been emerging as a new category of triplet photosensitizers [4]. Indeed, several examples of unidirectional Dexter's like Energy Transfer have been already reported [5]. Herein the first example of bidirectional, that is reversible, energy transfer occurring between QDs and a suitable organic chromophore bound to their surface is presented.In our nanohybrids, the emitting state of a suitably synthesized CdSe QD sample undergoes an equilibration with the energy-matched lowest triplet excited state of 1-pyrene carboxylic acid (1-PCA), which ultimately gives rise to an unprecedented thermally activated delayed photoluminescence from the nanocrystals and, as a consequence, to the elongation of their lifetime by several orders of magnitude. Strong experimental evidences of the effect of the oxygen and of the size of the QD were also observed [6]. [1] *J. Phys. Chem*. **1996**, *3654*, 13226. [2]*Chem. Rev*. **2010**, *110*, 389. [3] *Nature Methods* **2008**, *9*, 763. [4]*Science* **2016**, *351*, 369. [5]*Inorg. Chem*. **2018**, *57*, 2351. [6]*Angew. Chem*. **2018**, *57*, 3104-3107

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