Title: **Towards the Reversible Electronic Energy Transfer. Synthesis and characterization of Quantum Dots nanohybrids.**

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The research presented in this thesis focused on the development of nanohybrids quantum dots for suitable photophysical processes. The supramolecular system consists of an inorganic nanocrystal functionalized with a certain organic chromophore. The photophysical process is based in a bidirectional, that is reversible, energy transfer. For this process to occur, specific energy requirements must be fulfilled, between the emitting state of the nanocrystal and the lowest triplet excited state organic chromophore anchored in its surface. Due to the known value of the energetic state of the organic chromophore, the quantum dot plays a key role. Thanks to the tunability of its photophysical properties regarding the size, it is possible to fulfil this particular synergy. To achieve this objective, CdSe quantum dots functionalized and 2-naphthalene carboxylic acid (2-NCA) were chosen. The nanohybrids were characterized by absorption and luminescence spectroscopy. According to different ratios of ligands, it was possible to modulate the size of different batches of nanoparticles therefore, synthesizing a suitable nanoparticle for the scope of the thesis.

However, the intrinsic instability of the sample regarding the extremely small size led to the impossibility of a comparison between functionalized and non-functionalized the nanoparticle because they no longer presented the same photophysical properties. Despite this, it was possible to verify the presence of the reversible energy transfer through the comparison of the same sample functionalized in deaerated and air-equilibrated conditions. Given that, in deaerated conditions, the nanohybrids showed a higher luminescence intensity in the time-gated detection and a longer luminescence decay in the time scale than the nanohybrids in air-equilibrated conditions.

Keywords: Nanotechnology, quantum dots, supramolecular system, energy transfer, luminescence.