Low-power upconversion via sensitized triplet-triplet annihilation in supramolecular polymers

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The photon upconversion (UC) via triplet-triplet annihilation (TTA) process, using the palladium(II) octaethylporphyrin (PdOEP) as sensitizer and the diphenylanthracene (DPA) as emitter, has been studied in various solutions and materials. The interest for this system has been growing with promising applications in fields such as bio-imaging and light harvesting. Current research focuses on finding a good material to incorporate the upconversion system that allows for a combination of the high upconversion efficiency seen in dilute solutions and the robust mechanical properties of solid polymers. The goal would be to integrate this material in devices. Based on the hypothesis that the noncovalent dynamic bonds could enhance the upconversion process by letting the dispersed dyes move freely in the matrix, which is a prerequisite for efficient TTA-UC, this Master thesis explores the possibility of using a supramolecular polymer matrix compare to standard soft and glassy polymers matrices already used to host an upconversion system.
This Master project thus investigate the use of a supramolecular polymer matrix formed by a trifunctional poly(propylene oxide) (PPO) core charring 2-ureido-4[1H]pyrimidinone (UPy) moieties at each branches' end to form a network hydrogen-bonded. The matrix was processed to integrate the PdOEP/DPA pair and various tests were executed to study the life-time and the efficiency of the upconverted fluorescence.

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