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Fluorescence Resonance Energy Transfer in a Supramolecular Assembly of Luminescent Silver Nanoclusters and Cucurbit[8]uril Based Host-Guest System

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Abstract : The understanding of interactions between organic chromophores and biologically useful luminescent noble metal nanoclusters (NCs) leading to an energy transfer process that has applications in light-harvesting materials is still in its nascent stage. This work describes a photoluminescent supramolecular assembly, made in two stages, employing an energy transfer process between silver (Ag) NCs as the donor and a host-guest system as the acceptor that can find potential applications in diverse fields. Initially, we explored the host-guest chemistry between a cationic guest, Ethidium Bromide and the anionic host Cucurbit[8]uril using spectroscopic and calorimetric techniques to decipher their interaction mechanism in modulating photophysical properties of the chromophore. Next, we synthesized a series of blue-emitting AgNCs using different templates such as protein, peptides, and cyclodextrin. The as-prepared AgNCs were characterized by various spectroscopic techniques. We have established that these AgNCs can be employed as donors in the FRET process with the above acceptor for FRET-based emission color tuning. Our in-depth studies revealed that surface ligands play a key role in modulating FRET efficiency. Overall, by employing a non-covalent strategy, we have tried to develop FRET pairs using blue-emitting NCs and a host-guest complex, which could find potential applications in constructing advanced white light-emitting, anti-counterfeiting materials, and developing biosensors.

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