Protein-Sized Fluorogenic Micelles: Design and Imaging Applications

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The key challenge in the field of fluorescent organic nanoparticles (NPs)[1] for biological applications is to achieve superior brightness for sizes equivalent to single proteins (3–7 nm). We propose a concept of shell-cross-linked fluorescent micelles, in which PEGylated cyanine 3 and 5 bis-azides form a covalently attached corona on micelles of amphiphilic calixarene bearing four alkyne groups. The fluorescence quantum yield of the obtained monodisperse NPs, with a size of 7 nm, is a function of viscosity and reached up to 15% in glycerol. In the on-state they are circa 2-fold brighter than quantum dots (QD-585), which makes them the smallest PEGylated organic NPs of this high brightness. FRET between cyanine 3 and 5 cross-linkers at the surface of NPs suggests their integrity in physiological media, organic solvents, and living cells, in which the NPs rapidly internalize, showing excellent imaging contrast.[1] To achieve specific targeting of biomolecules, such as proteins and DNA, in the cells, the surface of these micelles has been modified with different ligand. The obtained calixarene micelles with a cyanine corona constitute a new platform for the development of protein-sized ultrabright fluorescent NPs.

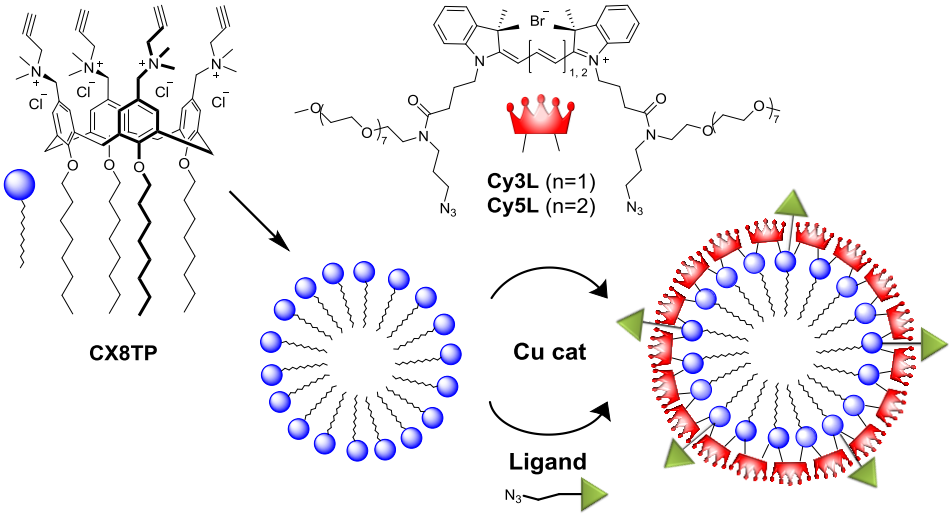

Figure 1. Concept of shell-crosslinking of calixarene micelles with cyanine corona

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References:

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