Design of Tailored Fluorescent Colloidal Probes using Thermodynamically Stable Nanovesicles as Scaffolds

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For bioimaging purposes, non-cytotoxic fluorescent labels are in demand, stable in biological media and capable of site-specific labelling. However, many fluorescent dyes with promising properties, are poorly water-soluble and often lose their properties in water. The conjugation of hydrophobic dyes to aqueous colloidal structures, such as nanovesicles, is a promising strategy to overcome this limitation. In the frame of Nano2Fun Marie Curie ITN project, we have engineered a new class of fluorescent organic nanoparticles (FONs) using thermodynamically stable nanovesicles named quatsomes [1-4]. These fluorescent nanostructures are obtained by the self-assembly of organic or inorganic fluorophores with sterols and quaternary ammonium surfactants [5-7]. They show excellent colloidal stability and structural homogeneity along with superior optical properties, in comparison with the fluorophores in solution. Fluorescent quatsomes have enhanced optical properties, e.g. brightness, in comparison with other nanostructures in water of the same fluorophores. Moreover, when these new FONs are prepared by a CO_2-based process, named DELOS-SUSP, homogeneous supramolecular arrangement is guarantee, leading to higher optical performances.
Quatsomes can be precisely decorated at their surfaces with targeting groups [3], opening the use of fluorescent quatsomes for site-specific labelling.
All such benefits make fluorescent quatsomes promising probes for bio-imaging and theranostic applications.

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