FLUORESCENT ORGANIC NANOPARTICLES DEMONSTRATING HIGH FRET EFFICIENCY FOR THEIR USE AS BIOIMAGING PROBES

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In the very recent years, FRET-based nanoparticle for biosensing, bioimaging, and theragnostic applications have experienced an unprecedented upsurge of interest.[1],[2] One of the advantages of FRET over single fluorophores as optical reporters is the relatively larger gap between the excitation and emission maxima and thus can significantly reduce the background while imaging. The use of nanoparticles as nanocarriers for the loading of the organic dyes offers an interesting strategy to bring organic dyes in aqueous media showing photostability, biocompatibility and generally, higher brightness. Considering the challenges for obtaining an ideal fluorescent bioprobe based on FRET, in this work, two carbocyanine molecules (DiI and DiD) were simultaneously loaded into quatsomes (QS), a new class of nanoscopic unilamellar vesicles made by surfactants and sterols.[3] Dye-loaded QSs were prepared by a one-step method using compressed CO_2, named depressurization of expanded liquid organic solution-suspension (DELOS-susp).[4] Indeed, it is a green technology leading to a formation of a highly homogenous dispersion of quatsomes in an aqueous environment (Figure 1, top). The obtained fluorescent organic nanoparticles (FONs) allow the dispersion and stability of the FRET pair organic dyes on aqueous media, ensuring photostability, biocompatibility and attractive spectroscopic properties for their use as bioprobes. Of special interest is their huge brightness displayed, ~100-fold brighter than commercial Quantum Dots emitting at same wavelengths. We anticipate this novel fluorescent organic nanoparticle with tremendous FRET efficiencies, stable during long periods of time, and biocompatible to gain a vast impact and set of applications in different fields, including bioimaging. This kind of nanostructures can be easily functionalized with targeting groups, representing a very promising platform, especially for theragnostic nanomedicine.[5], [6]

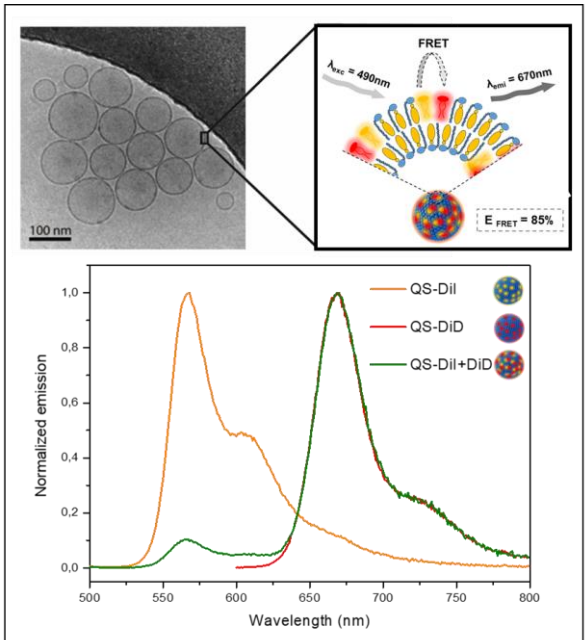

Figure 1. Cryo-TEM image of QS and schematic representation of QS membrane organization with FRET(top) . Emission spectra of QS containing the lipophilic dyes (down).

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