Molecular dye-based Fluorescent Organic Nanoparticles: a bright 10 years story

J. Daniel,[1] T. Bsaibess,[1] P. Pagano,[1] M. Rosendale,[1] C. Mastrodonato,[1] Ophélie Dal Pra,[1] J.-B Verlhac[1], M. Blanchard-Desce[1]* *et al*

[1]*Univ. Bordeaux, CNRS, Bordeaux INP, ISM, UMR 5255, F-33400 Talence, France*

** e-mail: mireille.blanchard-desce@u-bordeaux.fr*

For the last decade, our group has been developing a new class of ultra-bright fluorescent nanoparticles *via* a bottom-up approach based on the design of dedicated organic Polar and Polarizable Dyes (PPDs) that spontaneously form fluorescent organic nanoparticles (FONs) upon self-aggregation in water. Via subtle molecular engineering of the PPD, we could achieve fluorescent nanoparticles combining small size (Ø 10-50 nm), very large one and two-photon brightness (up to (up to 10^8 $M^{-1}cm^{-1}$ and 10^6 GM), remarkable structural and colloidal stability, tunable emission (from blue to NIR1), good photostability as well as biocompatibility (*in cellulo* and *in vivo*). As such, these non-covalent fully organic nanoparticles represent an easy to prepare, versatile and highly promising alternative to quantum dots for bioimaging purposes.[1-3] Furthermore, their surface properties can be engineered to yield tunable, hyper-bright and photostable NPs that either easily penetrate inside cells while maintaining their integrity (allowing single particle tracking within cells)[2] or alternatively can be made naturally stealthy and diffuse deep into the brain's extracellular space.[3] Future developments include surface functionalization for biosensing and cellular targeting. *In this poster, we will present the history of the FONs developed in the team from the 2010's until now.*

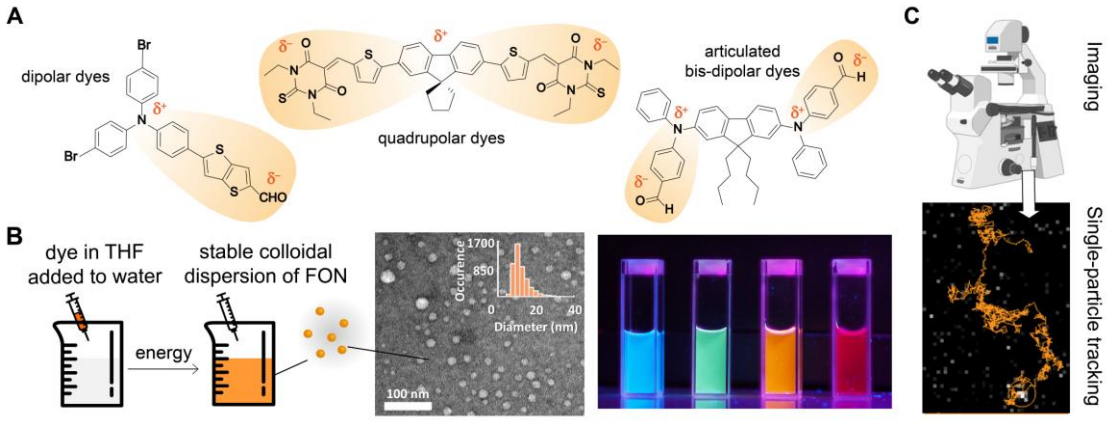

Figure 1. From molecular design of PPDs (A) to FONs (B) and application to bioimaging (C)

[1] a) V. Parthasarathy et al, Small, 7 (2011), 3219. b) K. Amro et al, Tetrahedron, 70 (2014), 1903. c) C. Mastrodonato et al, Molecules, 21 (2016), 1227. d) Verlhac J.-B., Daniel J., Pagano P., Clermont G., Blanchard-Desce M., C. R. Chimie, 19 (2016), 28.

[2] a) E. Genin et al, Adv. Mater., 26 (2014), 2258. b)J. Daniel et al, J. Phys. D: Appl. Phys., 49 (2016), 084002.

[3] a) M. Rosendale et al, Adv. Mater., 33 (2021), 2006644. b) M. Rosendale et al Proc. SPIE, 11360 (2020), 1136005. c) P. Pagano et al, J. Phys. Chem. C, 125 (2021), 25695