Nanopolarity mapping in multicompartment nanoarchitectures

Damiano Genovese[1], Francesco Palomba[1], Enrico Rampazzo[1], L. Petrizza[1], Nelsi Zaccheroni[1], Luca Prodi[1]

[1] *Dipartimento di Chimica "G. Ciamician", Università di Bologna, via Selmi 2, 40126, Bologna, Italy*

E-mail: damiano.genovese2@unibo.it

Mapping polarity inside nanomaterials is essential to capture their potential as nanoreactors, in catalysis or in drug delivery. We describe a method to obtain detailed, quantitative information on heterogeneous polarity in multicompartment nanostructures.[1] The method is based on a 2-steps procedure, i.e., (i) deconvolution of complex emission spectra and (ii) spectrally resolved analysis of FRET between multiple solvatochromic dyes. Colocalization of different polarities is thus obtained with nanometric resolution, which is henceforth called *nanopolarity mapping*. In particular, Prodan and Nile Red are shown to map the polarity of a water-soluble, multi-compartment nanostructure, named PluS nanoparticle (Fig. 1).[2] The two dyes report on a wide range of nanopolarities, demonstrating the coexistence of a rich variety of environments within nanometer distance. Their use as a FRET couple allows to reconstruct the spatial distribution of nanoenvironments, highlighting the proximity of strongly hydrophobic sites and hydrated PEG layer, yet proving that pure water-like signals are due to external bulk water.[3]

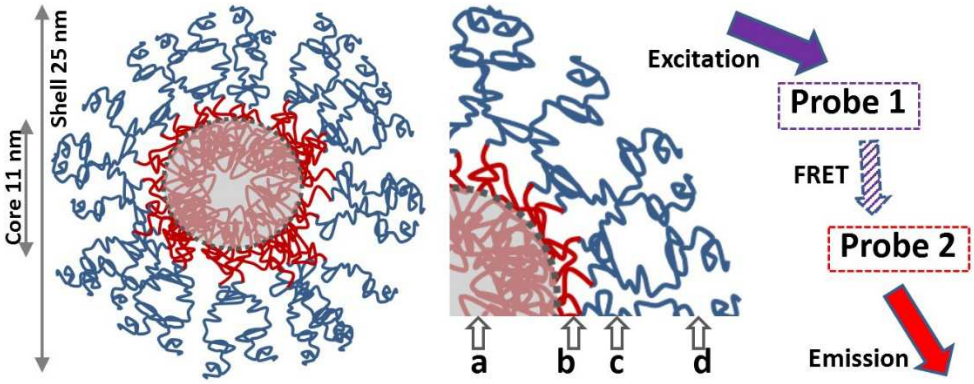

Figure 1. Cartoon of multicompartment nanostructures PluS NPs (left and center) probed by two luminescent solvatochromic dyes (right). Letters a-d indicate the compartments of the nanoparticles, specifically: a) dense silica core embedding PPO chains; b) PPO brushes emerging from the silica core; c) interfacial region with PPO and PEG; d) external layer with PEG brushes.

References: (Times New Roman 12)

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[2] D. Genovese, E. Rampazzo, S. Bonacchi, M. Montalti, N. Zaccheroni, L. Prodi, *Nanoscale*, **2014**, 6, 3022

[3] E. Rampazzo, S. Bonacchi, R. Juris, M. Montalti, D. Genovese, N. Zaccheroni, L. Prodi, D. C. Rambaldi, A. Zattoni, P. Reschiglian, *J. Phys. Chem. B.*, **2010**, 114, 14605.