BRIGHT AND PHOTOSTABLE FULLY-ORGANIC NANOPARTICLES FOR MULTICOLOUR SINGLE PARTICLE TRACKING

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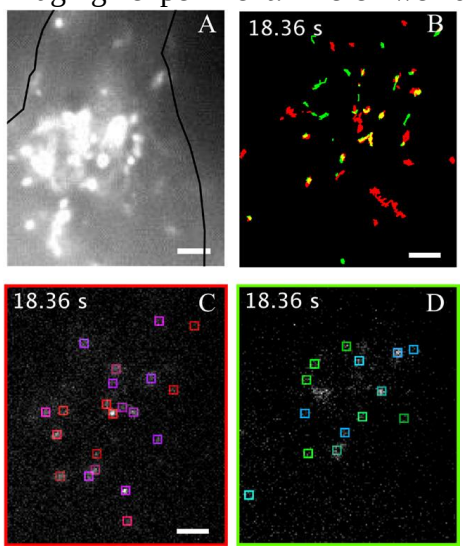
Single molecule tracking (SPT) is a powerful imaging technique which opens new opportunities for biologists for better monitoring and understanding of complex biological phenomena like fast dynamic processes in cells.[1] The live imaging of fast events such as the traffic of neurotransmitter receptors requires both high brightness as well as high photostability to ensure of short exposure times (video rate) and low light dose to minimize photo-degradation of biological materials. In this context, inorganic luminescent nanoparticles (such as semi-conductors nano-crystals QDs) have been used in SPT due to the lack of sufficient photostability and brightness of molecular organic dyes. However, the brightest among QDs (typically having heavy metal contain) suffer from toxicity, absence of biodegradability and blinking upon irradiation which could disturb the tracking during the live imaging experiment. Here we demonstrate the design and synthesis of hyperbright nanoparticles made only of *specifically designed* multipolar organic dyes that exhibit unique properties for single particle tracking experiments. These nanoparticles can be prepared via expeditious and green process and combine high (photo)stability and giant brightness thanks to molecular engineering and confinement. Moreover, the bottom-up engineering route allows tuning independently both their size (10-100 nm) and their emission color (from blue to NIR) and maintaining low toxicity. Our nanoparticles can be imaged and tracked at video-rate at the single molecule level in a multicolor imaging experiment using a monochromatic source of light (@488 nm). Their emission spectra can be tuned from green to NIR both in water and in cells.[2] During the presentation, new insight about these nanoparticles for single particle tracking experiments will be presented.



[1] L. Groc, M. Lafourcade, M. Heine, M. Renner, V. Racine, J.-B. Sibarita, B. Lounis, D. Choquet, L. Cognet, "Surface trafficking of neuritransmitter receptor : comparison between single-molecule/quantum dot strategies", *J. Neurosci.*, 2007, Vol. **27**, pp 12433-12437.
[2] J. Daniel, A. G. Godin, M. Palayret, B. Lounis, L. Cognet, M. Blanchard-Desce, "Innovative molecular-based fluorescent Nanoparticles for multicolor single particle tracking in cells", *J. Phys. D: Appl. Phys.*, 2016, Vol. **49**, pp. 084002-084010.