Nanomaterials with thermally-activated delayed fluorescence for live-cell imaging

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Thermally activated Delayed Fluorescence (TADF) has recently revolutionized the field of OLEDs owing to the ability of harvesting energy from non-emissive triplet states. This mechanism generates a long-lived photoluminescence component that also has tremendous potential to be used in optical sensing of local oxygen concentration and temperature or in time-resolved optical imaging.[1] Despite this strong potential, the application of TADF molecules in imaging and sensing has been hindered thus far due to their low aqueous solubility, low biocompatibility and poor performance in polar media.[1-3] Here in we demonstrate an approach to attain TADF luminescence in water, based on the encapsulation of TADF dyes in nanoparticles that effectively preserves their optical properties. Our luminescent nanoparticles were evaluated as potential optical probes for optical imaging, showing excellent biocompatibility and good cellular uptake. After effective internalization by human cancer cells, the luminescent nanoparticles localize primarily in the cytosol, enabling fluorescence microscopy imaging at very low dye concentrations.[2,3]

REFERENCES

[1] F. Ni, N. Li, L. Zhan, C. Yang, *Adv. Optical Mater*., **2020**, 69, 1902187.
[2] C.I.C. Crucho, J. Avó, R. Nobuyasu, S.N. Pinto, F. Fernandes, J.C. Lima, M.N. Berberan-Santos, F.B. Dias*, Mater. Sci. Eng. C*, **2020**, 110528
[3] C.I.C. Crucho, J. Avó, A.M. Diniz, S.N. Pinto, J. Barbosa, P.O. Smith, M.N. Berberan-Santos, L.O. Palsson, F.B. Dias, *Front. Chem*., **2020**, doi: 10.3389/fchem.2020.00404

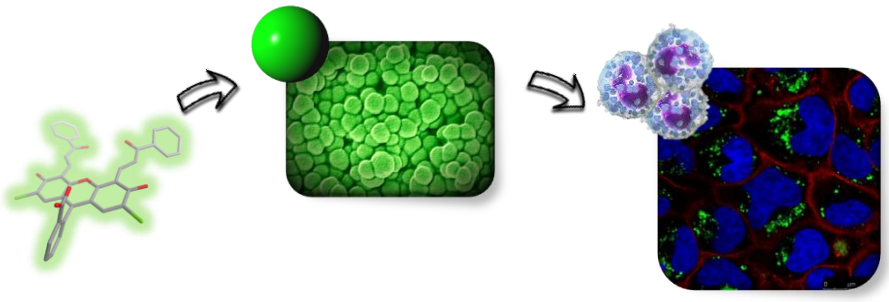

Figure 1: A TADF fluorescein derivative is grafted onto silica nanoparticles and used as TADF emitting optical probe in fluorescence imaging of cancer cells