

# INVESTIGATION OF THE PHOTODYNAMICS OF FLUORESCENT PERYLENE-DIIMIDE NANOPARTICLES COMBINING SINGLE PARTICLE AND ULTRAFAST SPECTROSCOPY

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**KEYWORDS:** perylenediimide, single nanoparticle, time-resolved spectroscopy

Even though the photostability of some organic dyes is not so good compared to inorganic Q dots, their versatility (the creation and design of tailored nanoparticles with different physical properties) is seen as an advantage for specific applications. Therefore interest on pure fluorescent organic nanoparticles has been growing extensively in the past decade because of their bio-compatibility, photo-stability and applications in biological imaging. In addition their emissive properties are strongly dependent on the environment and molecular packing within the nanoparticles [1]. Characterization of ultrafast photo-dynamics at single nanoparticle level and details with nanometric spatial resolution, however, are often lacking.

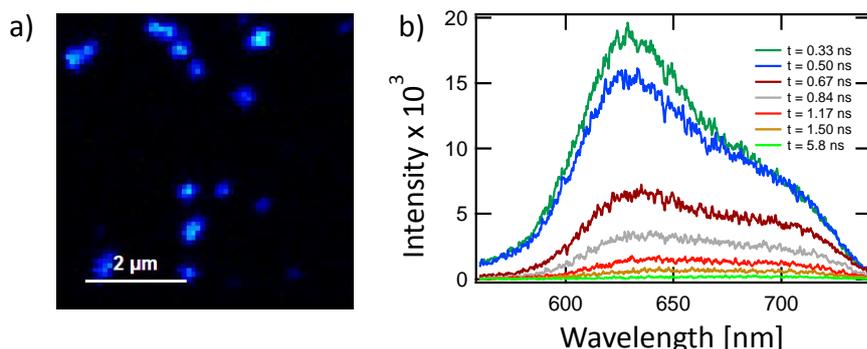


Figure 1: a) A fluorescence image of DBPI nanoparticles on a coverslip and b) A time-resolved decay associated spectra of a single nanoparticle.

yield [2]. Nanoparticles colloidal solution of perylene dye (*N, N'*-bis(2,5-di-tertbutylphenyl)-3,4,9,10-perylene dicarboximide (DBPI) has been successfully fabricated by precipitation method [3] and the fluorescence spectrum is characteristic of excimer behavior. By means of femtosecond transient absorption experiments and confocal microscope combining with an *em*-ICCD camera (time-resolved emission spectra with 440 ps resolution), we will discuss here in details the energy and charge carrier dynamics in solution and at the single nanoparticle level for these amorphous and polycrystalline nanoparticles. We will show that their time traces and ultrafast photo-dynamics is strongly dependent upon the number of molecules excited and environment.

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Perylenediimide (PDI) dyes have attracted a great deal of attention since they possess exceptional chemical, thermal, photochemical and photophysical stability in combination with high extinction coefficient and fluorescence quantum