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Hybrid materials: Films, Monoliths or Silica nanoparticles for optical and Photodynamic Therapy application.

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For many years, the interest about hybrid materials has increased due to their interesting properties in different fields such as nanoscience or intercalation chemistry. The incorporation of photoactive compounds (laser dyes or singlet oxygen photosensitizers) into various matrices with different shapes like films, monoliths or silica nanoparticles, could provide functional hybrid materials with interesting applications in optic, microelectronic or in biomedical field.

Macroscopically ordered inorganic matrix could increase not only the photostability but also induce to the organic guest preferential orientation and modify its properties. In this work, ordered hybrid films were elaborated with commercial Smectite-type clay, Laponite (Lap), a layered clay-type with a high purity and small particle size (≈ 30 nm). Due to the high adsorption capacity of Lap, a cationic dye such as pyronine or LDS (Figure 1) can be adsorbed into the well-organized Laponite multilayer and as a result, the cationic dye could be accommodated in a preferential orientation respect to the surface. Moreover, this macroscopically ordered systems would produce potential non-linear optics (NLO) devices such as dichroic filter or SHG materials [1].

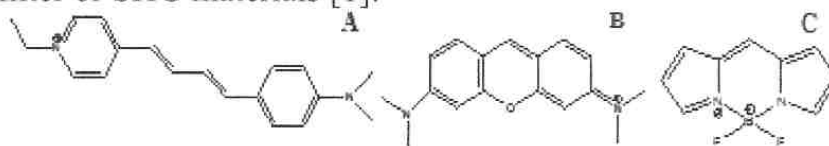


Figure 1. A) LDS 722; B) Pyronine and C) BODIPY molecular structure

Another suitable host for dyes is silica, since silica matrix presents several interesting properties: large surface area, tunable and large pore size, high porosity and good transparency. We were interested in embedding laser dyes or Reactive Oxygen Species (ROS) photosensitizers (PS) in silica to improve their photostability. Highly transparent silica monoliths (Figure 2) will also be checked for hosting laser dyes for optical materials application. Mesoporous silica nanoparticles with controlled size are one of the most convenient hosts for singlet oxygen photosensitizers with known application in photodynamic therapy (PDT). In this work, we will be interested in new grafted PS such as BODIPY derivatives (Figure 1) and in the determination of their photophysical properties in solid-liquid suspensions relative to their homogeneous solutions [2].

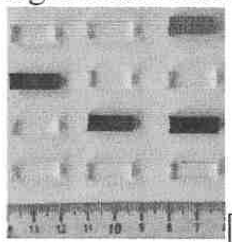


Figure 2. Dyes embedded in silica support.

[1]. a) V. Martínez, F. López, J. Bañuelos, I. López. *Chem. Mater.*, 17 (2005) 4734. b) S.Salleres, F. López Arbeloa, V. Martínez, C. Corcóstegui, I. López Arbeloa, *Mater. Chem. Phys.* 116 (2009) 550-556.

[2]. a) F. Ronzani, S. Sylvie, P. Bordat, T. Pigot, C. Cugnet, E. Arzoumanian, E. Oliveros, M. Sarakha, C. Richard, S. Lacombe, *Phys. Chem. Chem. Phys.* 15 (2013) 17219-17232. b) Q. Zhang, Z. Jiang. *Mater. Chem. Phys.* 69 (2001) 95-98 c) C. Shih-Hsun, L.Chia-Hung, Y. Chung-Shi, T. Fan-Gang, M. Chung-Yuan, L.Leu-Wei. *J. Mater. Chem.*, 19 (2009) 1252-1257.