

Composite sol-gel materials with plasmonic nanostructures for optical applications

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Hybrid materials have been intensively developed for optical applications (sensors, filters, imaging, photocatalysis...)[1] Interactions between optical components and plasmonic systems have also been an intensive field of research due to the possibility to tune and optimize the optical responses (emission, absorption) using the local electromagnetic field. We have developed the synthesis of various gold nanostructures with high yield and purity and exhibiting plasmon resonance spreading from the visible to the NIR wavelengths.[2] These nanostructures were functionalized in order to allow their homogeneous incorporation in transparent hybrid silica matrices using the sol-gel process.[3] Co-dispersion of the metallic structures with dyes was successfully achieved.[3,4] The role of the concentration, shape and size of the metal nanoparticles on the optical response was evaluated. The respective impact on the nonlinear optical response of the dyes will be discussed.

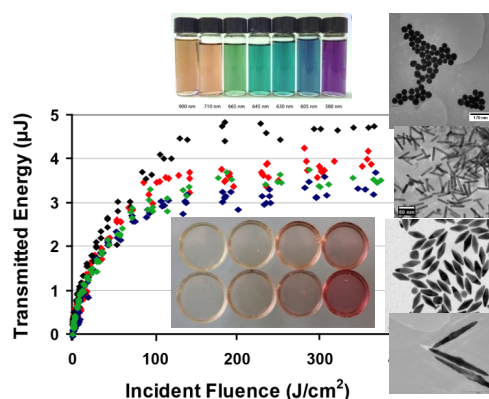


Figure 1. Hybrid materials incorporating various gold nanostructures and optical responses.

References:

- [1] S. Parola, B. Julian-Lopez, L. D. Carlos, C. Sanchez, *Adv. Funct. Mater.* **2016**, 26 (36), 6506-6544, DOI:10.1002/adfm.201602730.
- [2] D. Chateau, A. Liotta, F. Vadcard, J. R. G. Navarro, F. Chaput, J. Lermé, F. Lerouge, S. Parola, *Nanoscale* **2014**, 7, 1934.
- [3] D. Chateau, A. Liotta, D. Gregori, F. Lerouge, F. Chaput, A. Desert, S. Parola, *J. Sol-Gel Sci. Technol.* **2016**, DOI 10.1007/s10971-016-4116-y.
- [4] H. Lundén, A. Liotta, D. Chateau, F. Lerouge, F. Chaput, S. Parola, C. Brännlund, Z. Ghadyani, M. Kildemo, M. Lindgren, C. Lopes, *J. Mater. Chem. C* **2015**, 3, 1026.
- [5] D. Chateau, A. Liotta, H. Lundén, F. Lerouge, F. Chaput, D. Krein, T. Cooper, C. Lopes, M. Lindgren, S. Parola, *Adv. Funct. Mater.* **2016**, DOI: 10.1002/adfm.201601646