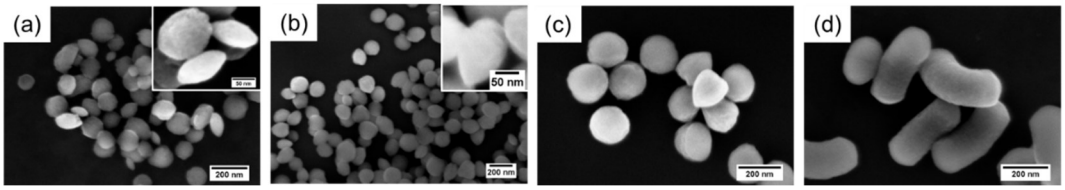
Synthesis of mesoporous (organo)silica nanoparticles

Xavier Cattoën (Xavier.cattoen@neel.cnrs.fr)
Institut Néel, UPR 2940 (CNRS- Univ. Grenoble Alpes)

Since the 2000s, the potential of mesoporous silica nanoparticles (*ca* 100 nm) as nanovectors for vectoring antitumor active principles in the body to tumors has been studied.[1] The advantages of these nanoparticles are their rigidity, their high pore volume, their ease of functionalization, and their biocompatibility.

The synthesis of these nanoparticles has been described in many protocols, often based on the first report published by V Lin.[2] It is this preparation method that we propose to learn in this practice. However, the mechanism of this synthesis is not very well understood, and a false mechanism is often reported in the literature. Good mechanistic research works were done based on SAXS studies, and varying experimental protocols. In this practice, it is proposed to investigate the initial phases of the sol-gel reactions involved in this synthesis by measuring pH during the first minutes, and monitoring the NPs nucleation by light scattering methods.[3]

The incorporation of organic groups within the nanoparticles structure is a good way to enhance the drug carrying ability.[4] In this sense, we will try to prepare organosilica NPs as well, and we will modulate the organization of the pores using additives.



Evolution of the morphology of mesoporous organosilica nanoparticles with increasing amounts of the sodium hydroxide concentration (Scale bars 200 nm).

1 R. R. Castillo, D. Lozano, B. González, M. Manzano, I. Izquierdo-Barba and M. Vallet-Regí, *Expert Opinion on Drug Delivery*, 2019, **16**, 415–439.

2 C.-Y. Lai, B. G. Trewyn, D. M. Jeftinija, K. Jeftinija, S. Xu, S. Jeftinija and V. S.-Y. Lin, *Journal of the American Chemical Society*, 2003, **125**, 4451–4459.

3 R. Alvarado Meza, T. Santori and X. Cattoën, *J Solgel Sci Technol*, DOI:10.1007/s10971-023-06130-w.

4 J. Croissant, X. Cattoën, M. Wong Chi Man, A. Gallud, L. Raehm, P. Trens, M. Maynadier and J.-O. Durand, *Advanced Materials*, 2014, **26**, 6174–6180.