**Contribution of electron microscopy to study the nanoscale and porous organization of self-assembled gelled oil materials**

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The electron microscopic observation of assemblies in the field of colloids or soft matter remains a challenge. Indeed, the techniques of preparation and/or observation must be non-destructive, in order to respect and preserve the morphologies of these fragile assemblies. Since several years, we focus our research on organogels materials. Organogels are organic solvents or oils that have been gelled using an organic gelator. Organic gelators are low-molecular-weight compounds that, at low concentrations, promote non-covalent self-assembly of fiber-like structures to form a 3D network in solution that can gelate various oils.

We prepared aqueous dispersions of organogels nanoparticles by hot emulsification, with a surfactant or a polymer as stabilizing agent, and cooling at room temperature. A comparative study of the emulsion and the corresponding dispersion ageing show greatly enhanced stability after gelation. The particles thus formed can be used to encapsulate hydrophobic drugs. TEM observation shows spherical particles with a mean diameter of 260 nm (Figure 1).

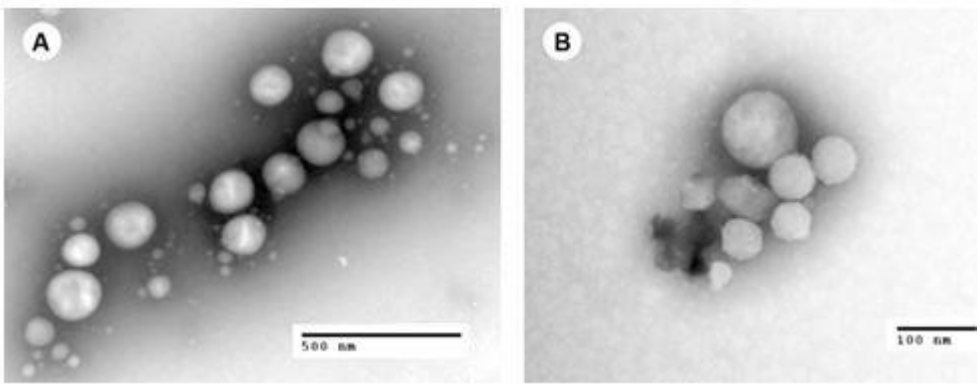


*Figure 1: TEM of gelled soybean oil nanoparticles (A) and (B)*

In particular conditions, it was possible to observe the formation of an original colloidal hydrogel based on these organogel nanoparticles. By cryo-MEB, it was possible to observe the three-dimensional morphology and porosity of this fragile assembly (Figure 2).

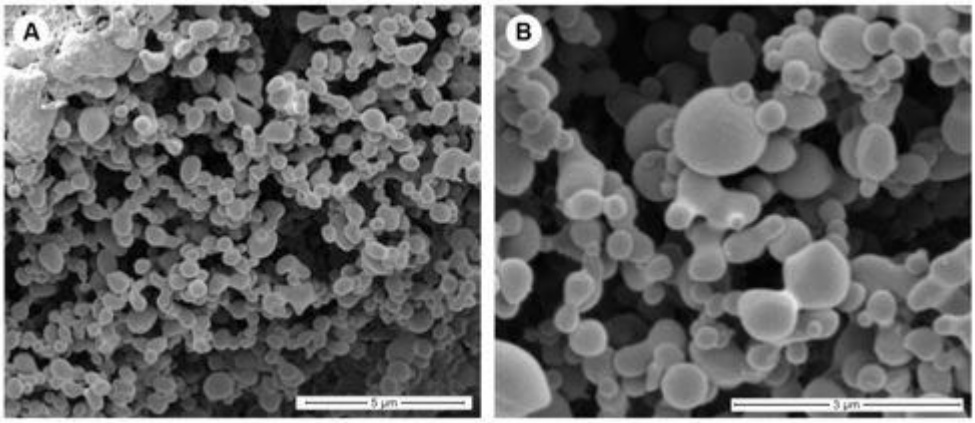


*Figure 2: Cryo-MEB observation of a colloidal hydrogel after sublimation (A) and a detail (B)*

We can also elaborate porous organogels materials by a particulate leaching method to introduce controlled porosity. We focused on a porous organogel made from renewable and biodegradable resources which could be interesting for cell culture or as new adsorbent material. The microstructure and the morphology of the materials were observed by low vacuum scanning electron microscopy (Figure 3A) and additionally microtomography reconstruction was applied (Figure 3B). Such materials were also evaluated for cell culture after 21 days, environmental SEM image were obtained (Figure 3C) and clearly shows the attached cells on the material.

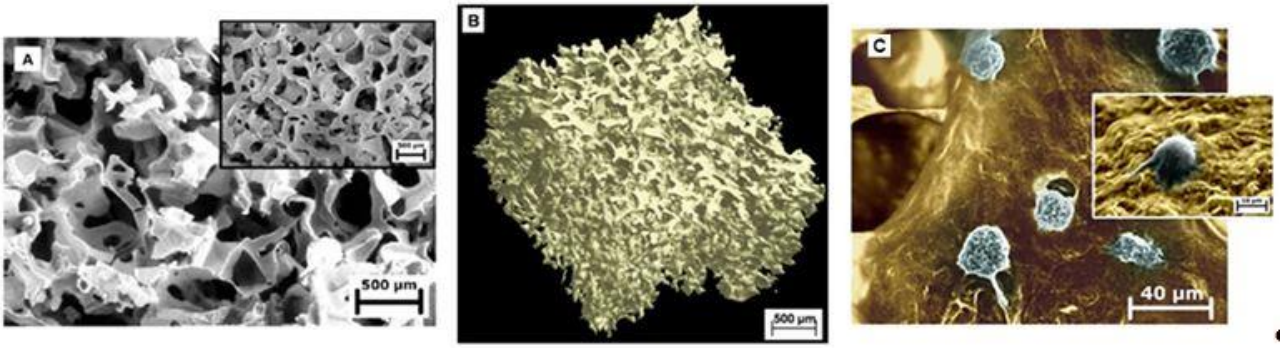


*Figure 3: (A) LV-SEM images of the internal morphology ; (B) microtomography reconstruction ; (C)* Colored environmental SEM micrograph of CHO fibroblast *microtomography*

All of these results underline the importance of electron microscopy in the characterization and optimization of this original family of self-assembled porous material.