2. Self-assemblies and new hybrid architectures

Metallic nanoparticles for microelectronics and energy

In collaboration with P. Fau at the LCC and in the framework of a collaboration with ST-Microelectronics, we studied the stabilization of copper NPs for their deposition in deep trenches in order to realize 3D circuits on and in silicon (Chem Eur J 2015). Amine ligands which delay the oxidation of Cu (J Phys Chem C 2017) and which can be used to destabilize Cu particles (ACS Appl Mat & Interfaces 2018) have been used. In addition, it was necessary to develop a new method for producing a barrier layer of MnO2 (Angew Chem 2016). All this constitutes a new method of manufacturing conductive lines in microelectronics.

In collaboration with P. Simon (CIRIMAT), we participated in the development of a new method for the preparation of nano-porous carbons that can be used as supercapacitors. The characteristic of these capacitors is that they can be detached from metal or silicon supports and give rise to a carbon material that can be used in flexible electronics. (Science 2016, J Power Sources 2016, Adv Funct Mat 2017). Finally, in collaboration with Mr. Respaud (Nanomag) and P. Simon (CIRIMAT), we have developed a method of laser-writing using NPs or precursors, molecules or salts, which makes possible the production of tracks made of metallic (magnetic or not), semiconductors and carbonaceous materials. A patent was filed and a first article has appeared (Electrochim Acta 2018).