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NANOSTRUCTURED ORGANOSILICA BIOMATERIALS FROM RENEWABLE RESOURCES

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The recent emphasis in synthesis of self-assembled architectures containing organic and inorganic building blocks at the nanometric scale has triggered an innovative input into the design of various materials possessing advanced properties.[1] In particular, their applications concern various domains such as separation sciences and environmental remediation, supported catalysis, optics, chemical or biological sensing and drug delivery using "smart" hybrid system.
Beside their functionalization, innovative approaches were used to diversify the nature of organic fragment in hybrid materials. There is particularly a growing interest for bio-inspired materials which open the way for new applications in biomedicine and nanotechnologies.[2] Hence, organosiliceous materials integrating sugar or polysaccharides macromolecules, DNA, polylactides, aminoacids, proteins and other sophisticated bio-molecules were recently reported. Surprisingly, despite decades of work on oil and fats functionalization, polymerizable and sol-gel processable fatty compounds have remained rather esoteric structures and their technological potential has been underexploited. This is mainly due to the difficulties associated to the selective functionnalisation of fatty compounds, especially their lower reactivity with organometallic derivatives necessitating further requirements with complex chemistry.
Our specific contribution in this field was focused on the selective metallation of fatty acids with self-assembling ability.[3] Introducing a triethoxysilyl arm in the fatty derivatives provides a series of processable sol-gel monomers allowing the preparation of carboxylic acid functionalized MCM-41 and SBA-15 type materials. The specific template/fatty acid interactions and the accessibility of the carboxy functionalities confined in the solid frameworks were elucidated.