Regioselective functionalization and assembly of patchy particles

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One emerging approach to confer colloidal particles predetermined "instructions" for assembly into any desired structures is to decorate the surface of the particles with "sticky patches". In this talk, we report on a new route to synthesize patchy particles with a controlled number of patches or dimples as well as on their potential use as building blocks for the elaboration of new supracolloids with unusual morphology.
We have recently reported the synthesis of dimpled silica particles through the growth of the silica core of colloidal molecules made of a central silica core surrounded by a precise number of polystyrene satellite nodules [1,2]. We have also shown that some organic residues corresponding to the grafted PS chains remain at the bottom of the dimples (see figure (left)). These organic residues were selectively chloromethylated, which paves the way for further functionalizations such as amination or azidation. We also synthesized silica particles functionalized with a complementary group to the one grafted on the organic residues and we adjusted their diameter in order to use them as a key which can lock into the dimples.
We thus obtained supracolloidal structures made of a precise number of silica spheres around a dimpled silica core (see figure (right)).

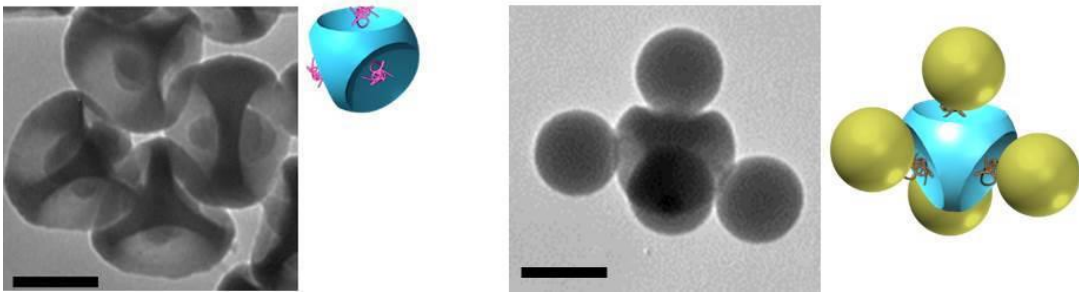

Figure: (left) TEM image and scheme of dimpled silica particles with organic residues (pink on the scheme); (right) TEM image and scheme of a supracolloid made of 4 silica particles around a dimpled core. Scale bars: 100 nm

[1] A. Désert, C. Hubert, Z. Fu, L. Moulet, J. Majimel, P. Barboteau, A. Thill, M. Lansalot, E. Bourgeat-Lami, E. Duguet and S. Ravaine, *Angew. Chem. Int. Ed.,* 2013, **52**, 11068
[2] C. Hubert, C. Chomette, A. Désert, M. Sun, M. Tréguer-Delapierre, S. Mornet, A. Perro, E. Duguet and S. Ravaine, *Faraday Discussions,* 2015, **181**, 139