

Synthesis of raspberries-like nanoresonators which exhibits an unusual optical magnetism at visible frequencies

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Development of new nano-objects to achieve new properties or functions is one of the major challenges in nanosciences and nanotechnology. In this context, hybrids nanosystems, combining different materials of different nature in the same nanoparticle, offer a wide range of new and unexplored possibilities. Proper design of a hybrid nanoparticle permit a control over the interactions of material components, bringing the possibility to combine different confinement-induced properties, create new ones or introduce new functionalization or addressing possibilities.

Herein, we present a successful synthesis of raspberry-like metallic nanoclusters. The use of conventional dielectric cores or patchy ones (1), developed via polymer chemistry, allows to control precisely the number and the location of metallic particles (2) located at their surface. Precise study of their optical properties, at a single nanoparticle level, was investigated via spatial-modulation spectroscopy (SMS) technique. It reveals novel plasmonic effects with important impact in the fields of nanooptics, nanophotonics and metamaterials (3) operating in the visible frequencies.

References

- [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.*, **52** (2013), 11068.
- [2] P. Massé, S. Mornet, E. Duguet, M. Tréguer-Delapierre, S. Ravaine, A. Iazzolino, JB Salmon, J. Leng, *Langmuir*, **29** (2013), 1790.
- [3] J. Angly, A. Iazzolino, JB Salmon, J. Leng, S. Chandran, V. Ponsinet, A. Desert, A. Le Beulze, S. Mornet, M. Tréguer-Delapierre, M. Correa-Duarte, *ACS Nano*, **7** (2013), 6465.

Figures

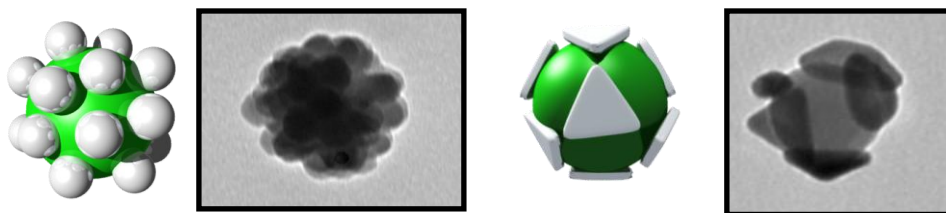


Fig. 1 Sketch and TEM micrographs of raspberry-like nanoresonators made of silica dielectric core and Ag_n isotropic and anisotropic satellites particles