UFR de Chimie

Master Molécules, Matériaux, Surfaces

université PARIS DIDEROT PARIS 7

Séminaire de Chimie Autour des Nanosciences

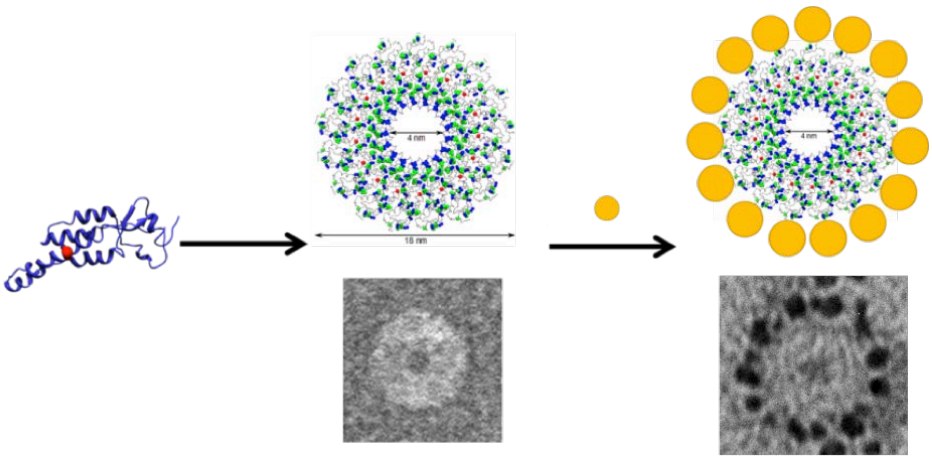
AMY SZUCHMACHER BLUM

McGill University

VIRUS INSPIRED METAMATERIALS

Metamaterials describe a class of materials in which material properties arise from the interaction of electromagnetic waves with the sub-wavelength sized component structures that constitute them. It has become clear that producing nano-based materials with properties not found in nature, such as metamaterials active at optical frequencies, requires breakthroughs in the ability to position materials with nanometer precision. This desire has led to a growing interest in bottom-up, self-assembling systems. One such approach is to use biomolecules as scaffolds because of the specificity and versatility they provide. In particular, the use of viruses as nanoscale scaffolds offers the promise of exquisite control for positioning on the nanoscale, using a particle that can undergo further self-assembly into extended structures, and allowing the simultaneous creation of many identical complex submicron geometrical structures.

Here, we present robust covalent techniques using tobacco mosaic virus (TMV) coat protein as a template to produce nanostructured metamaterials with novel properties. We construct plasmonically coupled meta-molecules on a sub-30nm size scale using a disk-shaped aggregate of TMV coat protein as a template for 3-D assembly of gold nanoparticle rings in aqueous solution. Theoretical models suggest that these rings may display metamaterial behavior at optical frequencies, and ensemble spectroscopic measurements reveal intriguing optical properties. Optical effects can be tuned by the introduction of a nanoparticle in the center of the rings through a pH dependent electrostatic interaction. Preliminary dark field scattering data, obtained for individual surface bound ring structures, is remarkably consistent with ensemble measurements, demonstrating that the observed optical properties arise from the ring structures. Thus, we show the utility of biotemplates in generating nanostructured building blocks for advanced materials.



LE VENDREDI 15 Avril À 11H00

Bat. Lavoisier, salle 774, 15 rue Jean de Baïf 75013 Paris

Contacts : Claire Fave et Vincent Noël,
Tél : +33 (0)1 57 27 72 26/72 08