Assembling thermoresponsive colloidal molecules with tunable directional interactions

P. Schurtenberger

Division of Physical Chemistry and Lund Institute of advanced Neutron and X-ray Science LINXS, Lund University, Lund, Sweden

Considerable efforts have recently been made in the synthesis of anisotropic colloids, inspired by molecules whose organisation is dictated by properties such as the valency and directionality of bonds. As a result, attempts were made to create colloidal analogues of molecules through assembly of spherical colloids into small clusters mimicking space-filling molecule models. These molecule-like clusters are collectively known as 'colloidal molecules'. Here we demonstrate that we can fabricate colloidal molecules with a well-defined number of binding sites and externally tuneable interactions. This is achieved by using microgels based on the temperature-responsive polymers poly-*N*-isopropylacrylamide (PNIPAM) or poly-*N*-isopropylmethacrylamide (PNIPMAM) as building blocks, which are then assembled into well-defined small clusters. The use of pNIPAM and pNIPMAM microgels allows for easy manipulation of the interactions between the resulting colloidal molecules via temperature, as the interaction potential between individual microgels changes from soft repulsive below the volume phase transition temperature (VPTT) of the microgels to attractive for T > VPTT. I will present different approaches to fabricate colloidal molecules, and demonstrate that microgel-based colloidal molecules represent an interesting class of colloidal building blocks with the potential to reversibly form complex structures and materials through temperature-tuneable directional interactions.

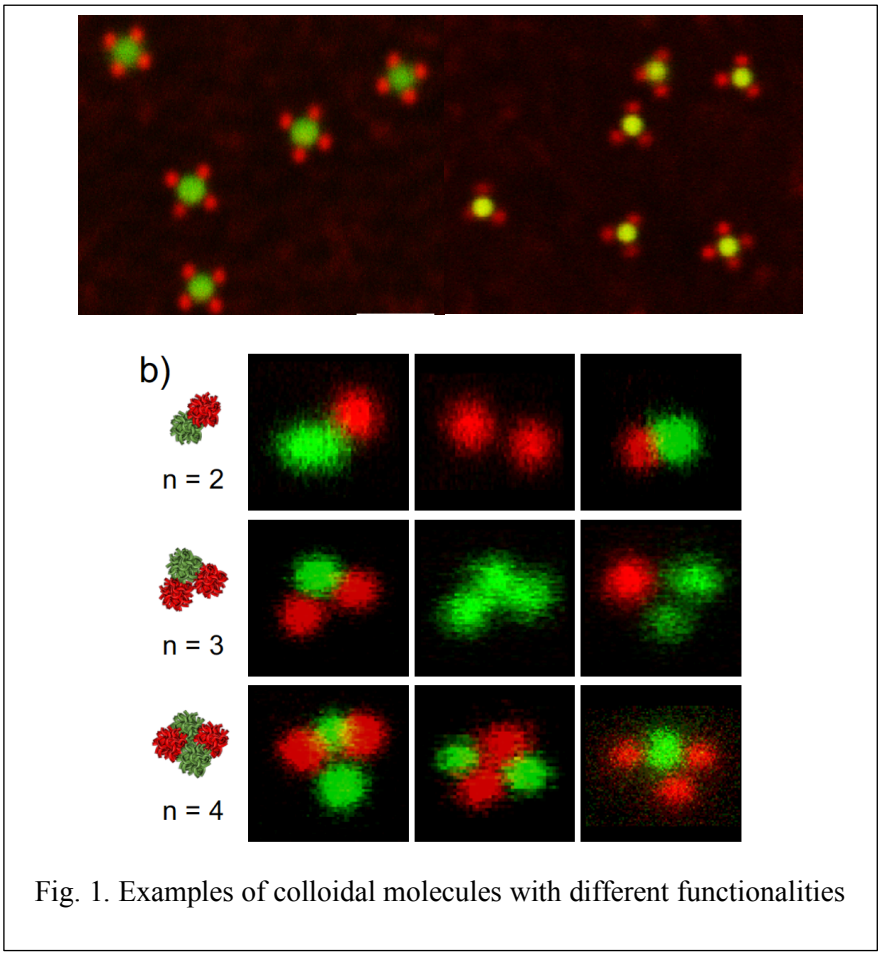

Fig. 1. Examples of colloidal molecules with different functionalities