Internally Nanostructured Raspberries

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The use and role of spherical nanocolloids as stabilizers in water of internally self-assembled domains dispersed from lipid-based lyotropic liquid crystalline phases is investigated and discussed. We focus on the relation between stabilization and formation of a colloidal armor around the lyotropic phase drops. The structural parameters are determined by Small and Very Small Angle Neutron Scattering (SANS and VSANS) under contrast matching conditions, and Cryogenic Transmission Electron Microscopy (Cryo-TEM). The adsorption of negatively spherical nanoparticles is low, and creation of armor is only possibly through a hydrophobic modification of the sphere surface during the process by addition of a cationic surfactant [1,2]. The adsorption ratio of the modified nanoparticles on the drops has been investigated, demonstrating the conditions in forming raspberry stabilized particles. The use of SANS and VSANS under contrast matching conditions allow to qualitatively determine the coverage as a function of the ratio between the colloidal concentration and the one of the added surfactant. This is demonstrated the progressive increase of the coverage while the stabilization decrease. These results represent further advances in smart carriers due to the possibilities of hierarchical functionalization of both the internal phase and the stabilizing particles.

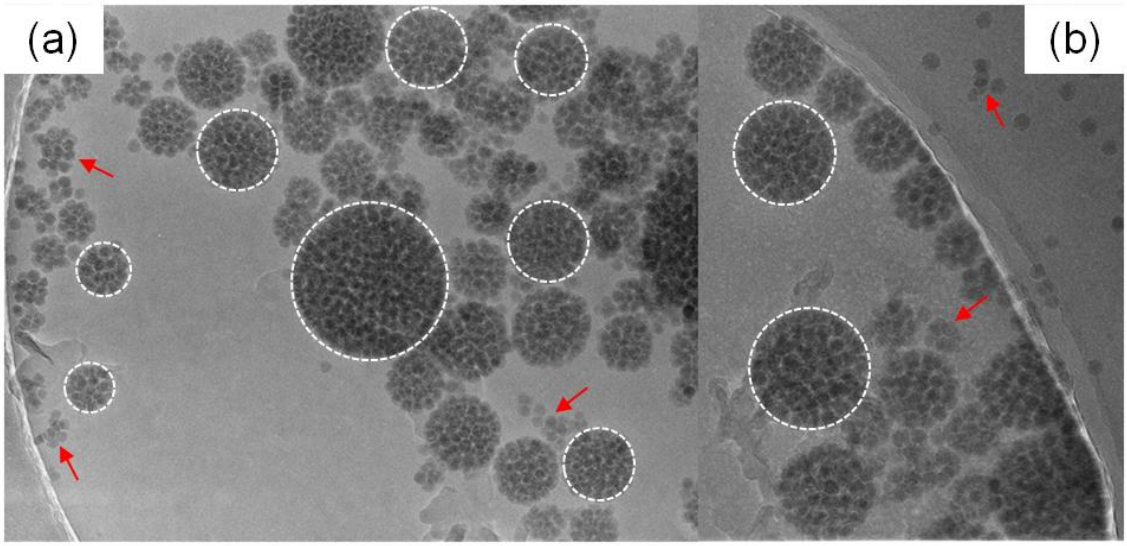

Figure 1. Typical cryo-TEM pictures of a sample composed of 5 wt% of L_2 phase (inversed micelles) stabilized in water by silica colloids (14 nm) and 5 10^{-5} M of CTAB (cationic surfactant).

[1] F. Muller, J. Degrouard, A. Salonen, A.P.L.B.L. Chapter 8, vol 18, 209 (2013).

[2] F. Muller, T. Dégousée, J. Degrouard, A. Brûlet and A. Salonen, *J. Colloids Interface Sci.*, 2015, **446**, 114.