Electronic Supplementary Material (ESI) for Soft Matter

Supplementary Information

Temperature Directed-Assembly of Coated-Laponite Nanoparticles in Pluronic Micellar Solutions

Imane Boucenna,[1] Marie-Alice Guedeau-Boudeville,[1] Alain Lapp,[2] Pierre Colinart,[1]

Amsha Proag,[1] Laurent Royon,[1] and Ahmed Mourchid[1*]

[1] Matière et Systèmes Complexes, UMR 7057 CNRS and Université Paris Diderot, cc 7057, 75205 Paris Cedex 13, France.

[2] Laboratoire Léon Brillouin, UMR 12 CNRS and CEA, F-91191 Gif-sur-Yvette, France

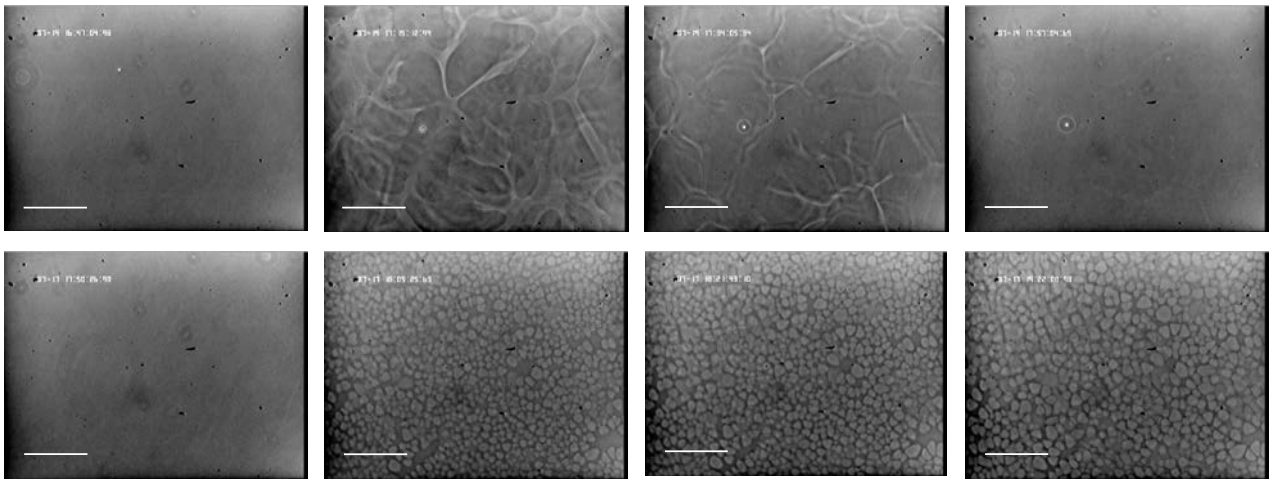

Figure S1. Comparison of optical microscopy on a sample at a copolymer weight fraction of 16 wt. % and laponite weight fraction of 0 wt. % (upper images) and a sample of copolymer weight fraction of 16 wt. % and laponite weight fraction of 2 wt. % (lower images) at the temperatures shown below the images. We notice that the pure copolymer micellar solution does not show textured grains as the temperature increase above the gelation temperature, while in the solution with laponite nanoparticles microscopic grains grow with temperature increase. The scale bar is 100 μm.

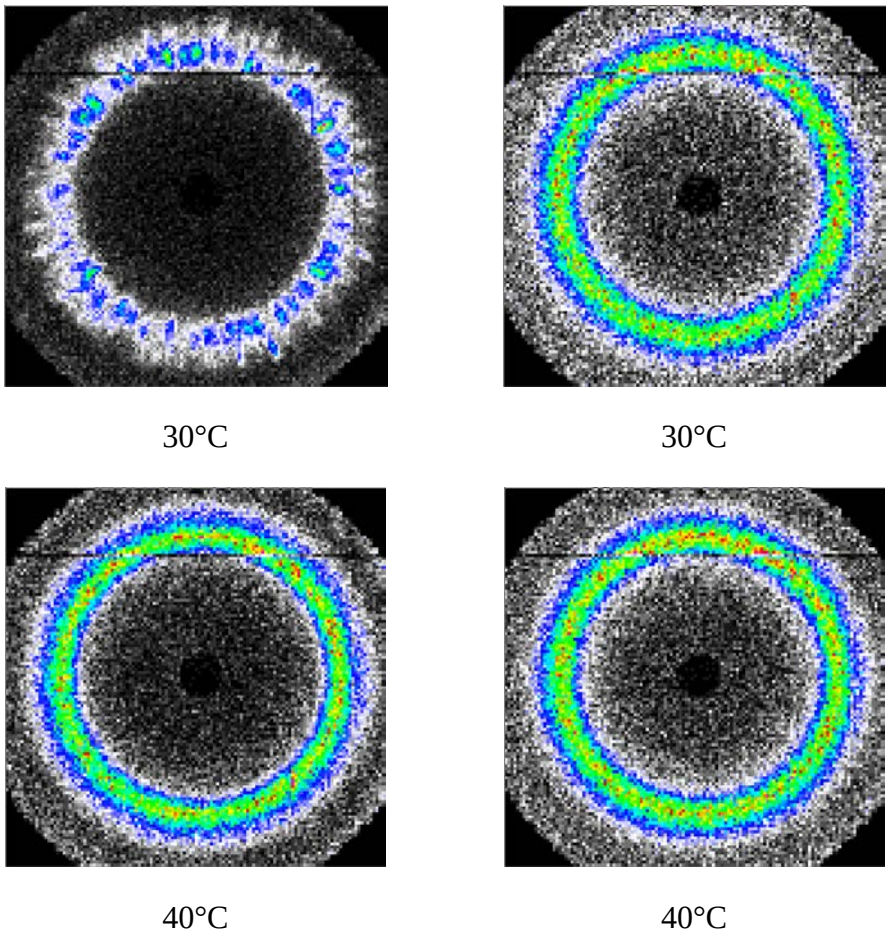

Figure S2. Comparison of small angle neutron scattering patterns on a sample at a copolymer weight fraction of 16 wt. % and laponite weight fraction of 0 wt. % (left) and a sample of copolymer weight fraction of 16 wt. % and laponite weight fraction of 2 wt. % (right) in a laponite-matched solvent (67 % D_2O and 33 % H_2O) at the two temperatures shown below each pattern. The rings are located at q_0 = 0.036 $Å^{-1}$. The two dimensional scattering patterns of the copolymer solutions without laponite particles reveal the presence of anisotropic scattering spikes in the first correlation peak. The appearance of these spikes suggests that the copolymer micelles are arranged in a macroscopic crystal lattice with a preferential orientation with respect to the beam. The two dimensional scattering patterns on the samples with added laponite show uniform correlation rings which suggest that the micelles are polycrystallized.

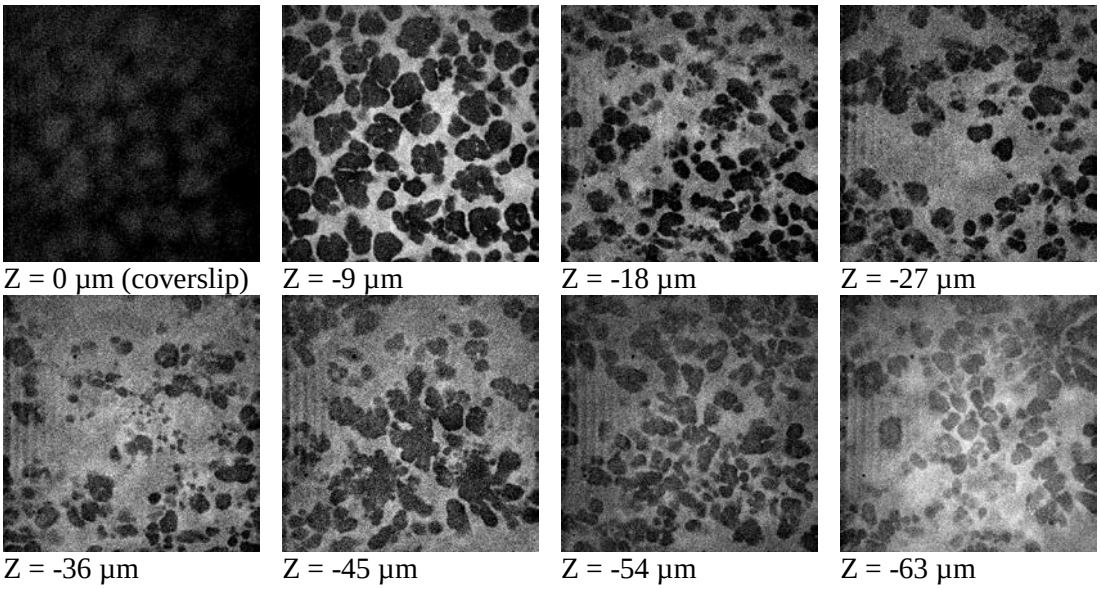

Figure S3. Confocal microscopy observation of the segregation of the laponite nanoparticles induced by crystallization of the pluronic copolymer micelles upon increasing the temperature from room temperature to 39°C. In this copolymer-laponite solution, the laponite particles were labeled with the cationic fluorescent dye 9-amino acridine. The microscopic images revealed non-fluorescent microscopic and disconnected growing grains in a surrounding continuous and fluorescent medium. Optical observation of different cross-sections through the sample, recorded at different depths from the upper coverslip down to 63 µm, shows that these grains are three dimensional morphologies with an average size of 10 µm. They primarily appear on the sample cell interfaces and their number increases as the temperature increases. This sequence of scans was obtained with copolymer weight fraction of 16 wt. % and laponite weight fraction of 2 wt. %. The size of each image is 128×128 μm^2.