ESRF	**Experiment title:** Crystalline Nano-Domains of PE latex from Free-Radical Polymerization under Mild Conditions	**Experiment number:** 02-01-849
Beamline: BM02	**Date of experiment:** from: 05 Sep 2014 to: 08 Sep 2014	**Date of report:**
Shifts: 9	**Local contact(s):** Cyrille Rochas	*Received at ESRF:*

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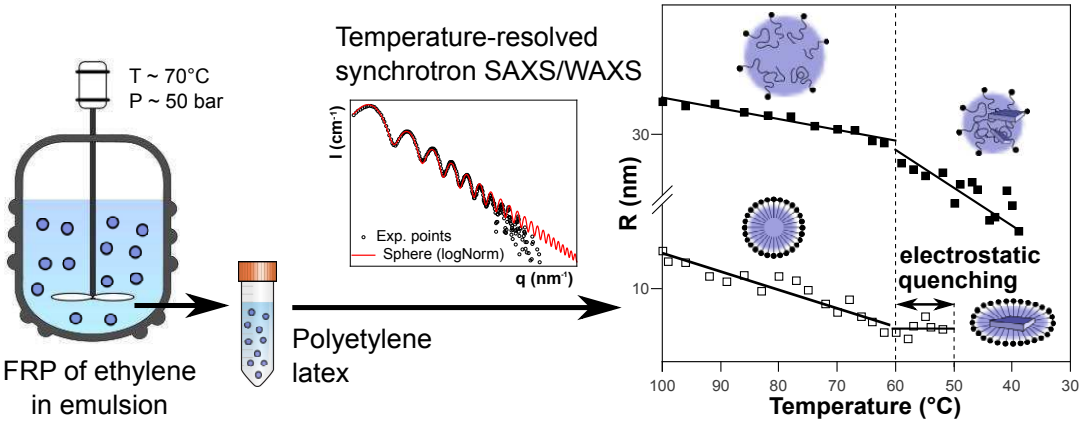
Report:

Semi-crystalline polyethylene (PE) nanoparticles were obtained by free radical emulsion polymerization under mild conditions of pressure and temperature. At high surfactant concentration, the obtained anisotropic nanoparticles exhibit a strong degree of supercooling. This paper explores the relationship between the morphology of such particles and their high degree of supercooling. The shape anisotropy of the semi-crystalline PE particles already observed by transmission electron microscopy was confirmed by dynamic light scattering with the autocorrelation function containing both translational and rotational diffusion coefficients as well as by *in situ* synchrotron small-angle and wide-angle X-ray scattering (SAXS/WAXS). Temperature-resolved synchrotron scattering was used to further characterize the evolution of particles morphology and crystallinity during cooling. Paying special attention to the role of the surfactant we propose a novel mechanism which contributes to a better understanding of the crystallization of PE nanoparticle. The observed supercooling might be the result of the Coulomb repulsion between the surfactant head groups present at the particle surface, which hinders the particle contraction upon crystallization. The high surface charge density prevents the reduction of the particle surface, thus forcing a morphological transition from sphere to oblate ellipsoid during crystallization. This mechanism would act as potential barrier to the crystallization, resulting in supercooling.



Brunel, F., Billuart, G., Dugas, P. Y., Lansalot, M., Bourgeat-Lami, E., & Monteil, V. (2017). Crystallization of Nanodomains in Polyethylene Latexes. Macromolecules, 50(24), 9742-9749.