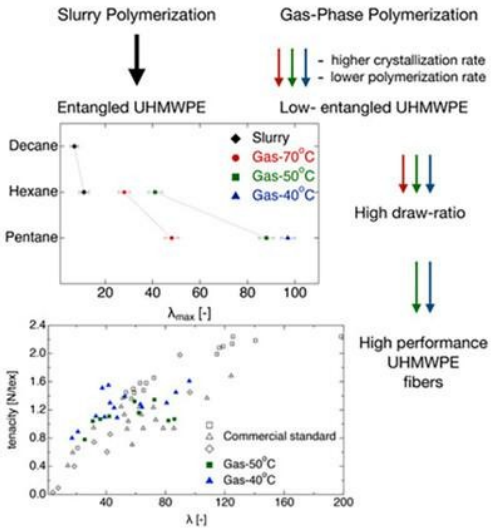
Experiment Report

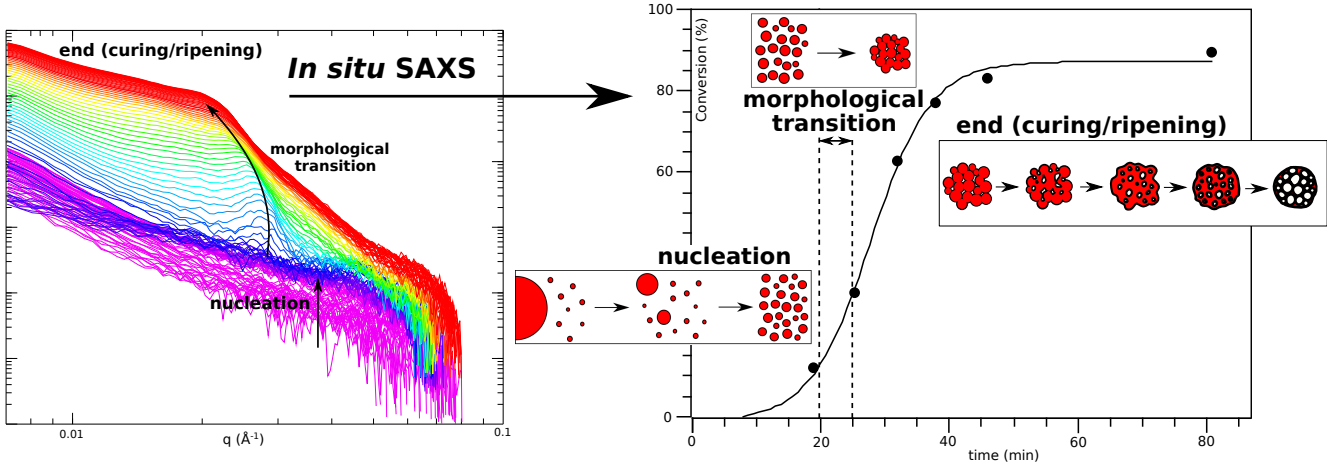
Proposal code: A02-1-898

Proposal Title : In Situ Investigations of Polymerization Induced Self-Assembly in Emulsion



This experience has already allowed us to publish an article where we explore the microstrucure (lamellar thickness) of ultra-high molecular weight polyethylene (UHMWPE).[1] The lamellar thickness l was calculated by multiplying the long period with the crystal volume fraction measured through WAXS. The average long period L of the lamellar stacking, was determined from the q-value, q_{max}, at which the Lorentz-corrected intensity reached a maximum, using the Bragg's condition: $L = 2\pi/q_{max}$. SAXS/WAXS-measured lamellar thickness l where correlated the the degree of entanglement and allows us to demonstrates the feasibility of producing low-entangled UHMWPE via gas-phase polymerization, offering promising properties for UHMWPE fibers comparable to commercial materials.

A second article is in progress [2], where time-resolved SAXS is used to gain insight into the morphological transition during PEG-X-mediated VAc PISA in emulsion. Here, we confirm a three-step PISA process: (1) nucleation of copolymer primary particles, (2) rapid morphological transition with improved monitoring, and (3) slow growth to final dimensions. Our study highlights a shorter transition step crucial for non-spherical morphologies through primary particle aggregation, aligning with MD simulations.



References:

[1] Do Rosario, R. L., Christakopoulos, F., Tervoort, T. A., Brunel, F., & McKenna, T. F. (2023). Gas-phase polymerization of ultra-high molecular weight polyethylene with decreased entanglement density. *Journal of Polymer Science*.

[2] Brunel, F. Galanopoulo, P. Espinosa E.R., Lansalot M. and D'Agosto F. In situ SAXS Investigation of Vinyl Acetate Polymerization-Induced Self-Assembly, in prepartion