Maximum Rate of Crystallization and Morphology of Random Propylene Ethylene Copolymers as a Function of Concentration of Comonomer up to 21 mol% Ethylene

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Supporting information.

In order to properly scale and subtract the diffractogram of the amorphous regions, diffractograms of PEs with ethylene > 10 mol% were obtained at different temperatures in the melt. An example is given in Figure S1a for PE16.9. The 2θ peak of the halo scales linearly with temperature (Figure S1b), reflecting the thermal volume expansion of the radial coils. This linear relation ($2\theta_{halo}$ = -0.008T + 17.4) was used to shift the diffractogram of the melt to the corresponding value at Tc > 25 ^{o}C. The procedure and the determination of the content of γ phase using mixed Gaussian + Lorentzian peaks to fit the resulting crystalline pattern is shown in Figure S1c.

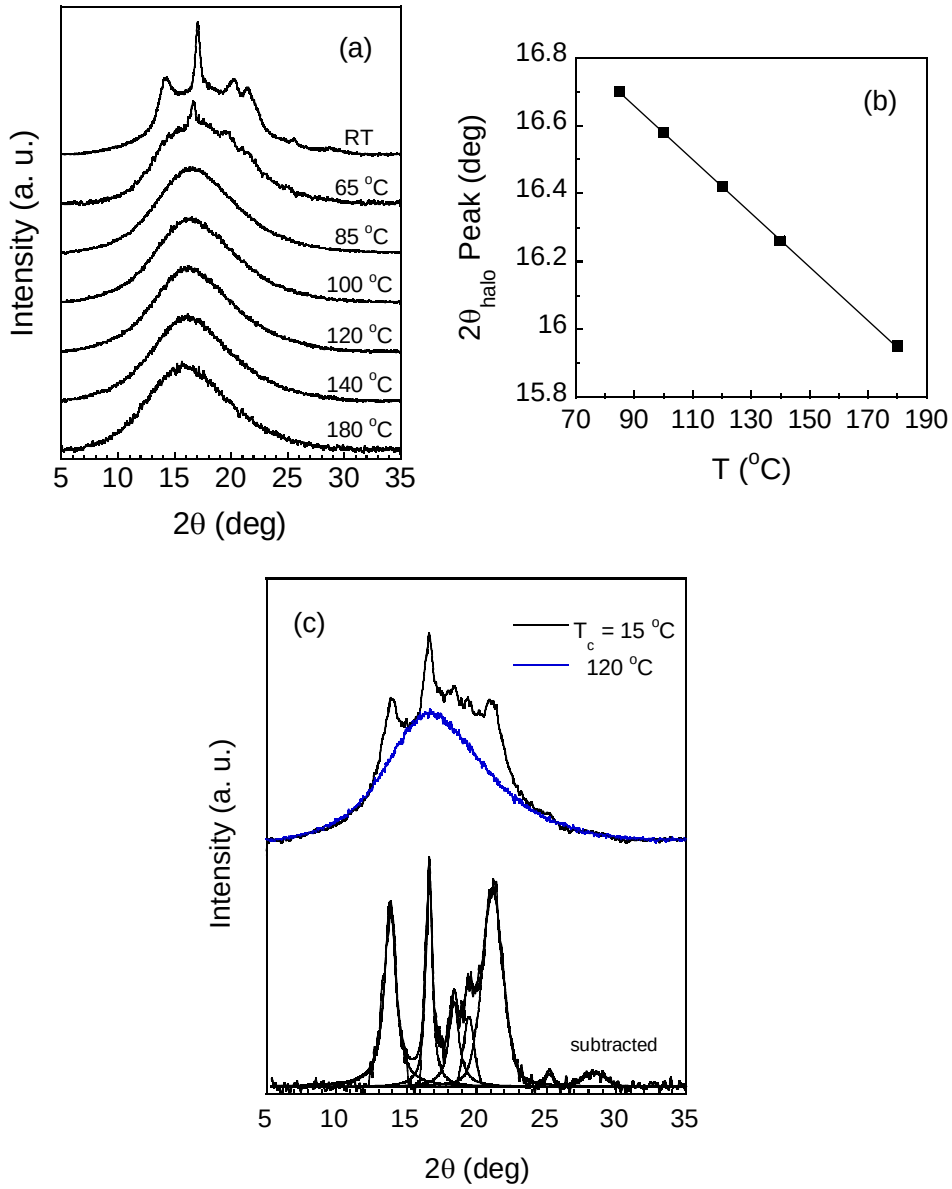


Figure S1. (a) Diffractograms of PE16.9 obtained at increasing temperatures. (b) Variation of $2\theta_{halo}$ with temperature reflecting volume expansion of radial coils. (c) Extraction of crystalline diffractogram and peak deconvolution to obtain crystallinity and polymorphic content.

Lamellar thicknesses were measured from cross-section profiles from AFM phase images, using the Jeol AFM process software. The thicknesses were obtained in edge-on lamellae from 0.6 × 0.6 μm^2 images as exemplified in Figure S2.

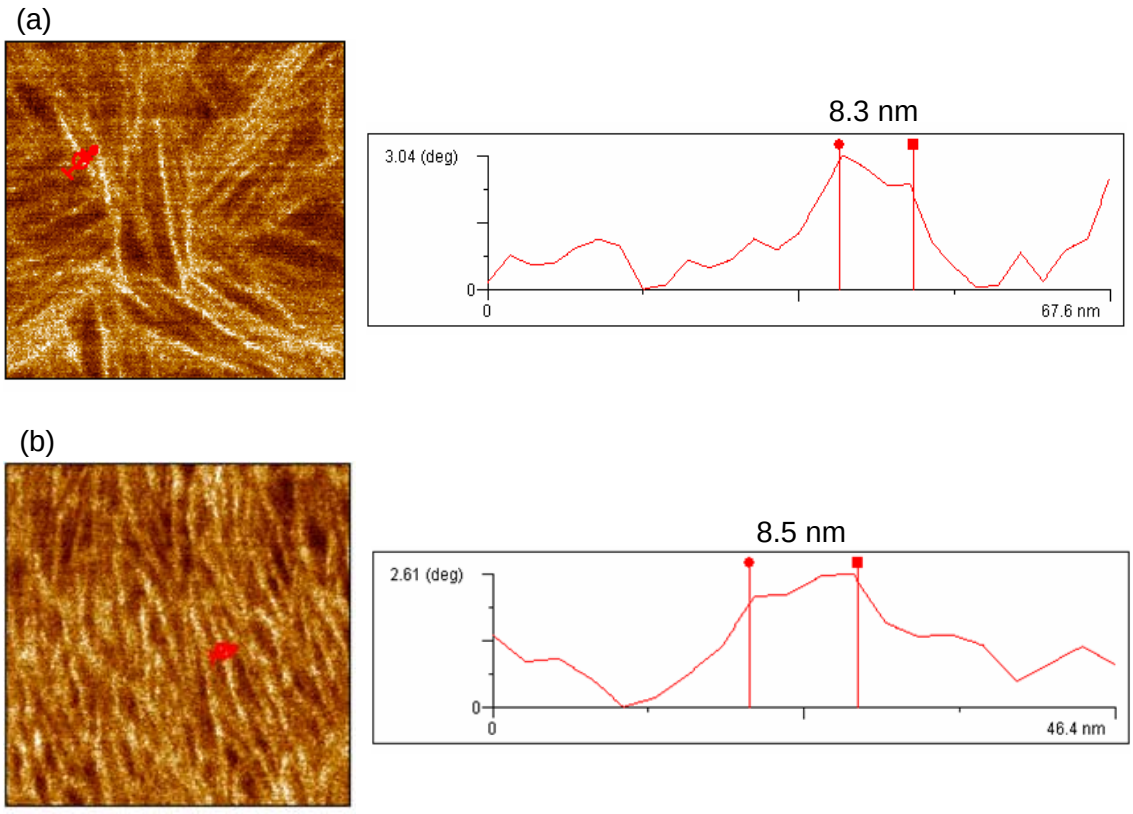
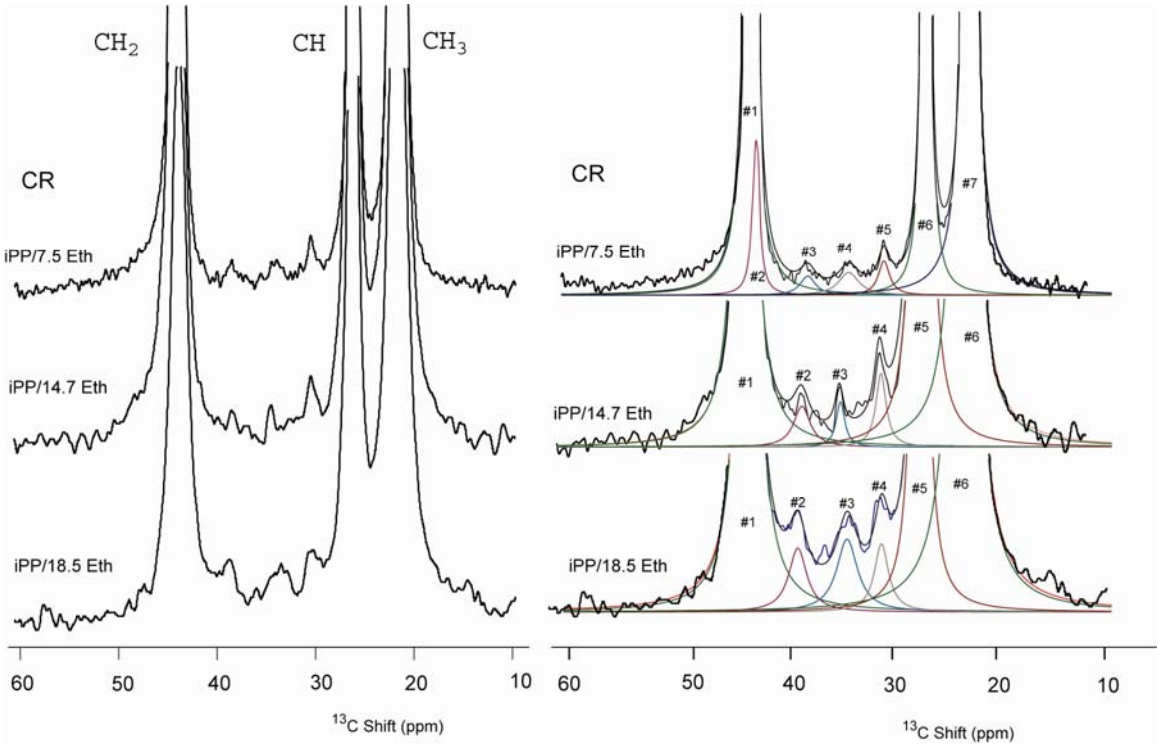


Figure S2. Representative examples of cross-section profiles for measurements of lamellar thicknesses. The phase images (0.6 x 0.6 μm^2) and the corresponding cross-section profiles are for (a) the PE20.8 film crystallized at 35 ^{o}C, and (b) the PE16.9 film at 45 ^{o}C.

Determination of partitioning of ethylene for copolymers with high ethylene content. Shown are solis-state ^{13}C NMR crystal spectra and analysis of areas of peaks associated with ethylene carbons (Reference 9 of manuscript).



Vertically amplified 75.5 MHz ^{13}C CP MAS spectra collected with contact times of 1 ms and spin lock of 6ms (iPP/7.5 Eth), and 3ms (iPP/14.7 Eth, iPP/18.5 Eth). The spectrum of iPP/7.5 Eth was recorded at ambient temperature and iPP/14.7 Eth, iPP/18.5 Eth at 290 K because these two last samples have lower melting temperature. Deconvolutions were processed on the basis of Gaussian/Lorentzian shapes using "dmfit program". [1] The peak number correspond to the number of deconvoluted peaks in the spectra.

1. Massiot, D.; Fayon, F.; Capron, M.; King, I.; Le Calvé, S.; Alonso, B.; Durand, J.-O.; Bujoli, B.; Gan, Z.; Hoatson, G. *Magn. Reson.Chem.* **2002,** 40, 70-76.