Polyolefin characterization using high-temperature thermal gradient interaction chromatography.

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Several crystallization-based techniques are used to measure the chemical composition distribution (CCD) of polyolefins, but they are limited to semi-crystalline polyolefins. Recently, high-temperature thermal gradient interaction chromatography (HT-TGIC) has been developed to quantify the chemical composition distribution of semi-crystalline *and* amorphous polyolefins, thus broadening the range of techniques available for the analysis of polyolefin CCD. Hypercarb® porous graphitic carbon (PGC) columns are commonly used as stationary phase in HT-TGIC. The fractionation mechanism is supposed to rely on the interaction of polyolefin chains with a graphite surface. HT-TGIC is considered by many researchers to be the next major step in a long sequence of polyolefin CCD-characterization techniques that started in the eighties with temperature raising elution fractionation (TREF). In the present investigation, a series of ethylene/1-octene copolymers having approximately the same molecular weight average and different comonomer fractions (up to 25% of 1-octene) were synthesized using a single-site catalyst to investigate the fractionation mechanism of HT-TGIC. Furthermore, three copolymer samples and their blends were also studied to determine which operation parameters influence HT-TGIC peak shape and position. To complement this study, a set of ethylene/1-octene copolymers having the same chain lengths and different comonomer contents was synthesized to study the effect of comonomer fraction on the fractionation mechanism of HT-TGIC. In addition, different commercial Hypercarb® columns (having distinct length, particle size, and inner diameter) were compared to evaluate how column type influences HT-TGIC fractionation.