Effect of operation conditions and column type on the fractionation of polyolefins by High-Temperature Thermal Gradient Interaction Chromatography.

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The chemical composition distribution (CCD) of semi-crystalline polyolefins is determined using several crystallization-based techniques. Recently, high-temperature thermal gradient interaction chromatography (HT-TGIC) has been introduced to estimate the chemical composition distribution of not only semi-crystalline but also of amorphous polyolefins, thus broadening the range of techniques available for the analysis of polyolefin CCD. Porous graphitic carbon columns (Hypercarb®) are commonly used as stationary phase in HT-TGIC to separate polyolefin chains based on their interaction with the porous substrate in a temperature gradient mode. In this investigation, a set of ethylene/1-octene copolymers having different comonomer fractions (up to 25% of 1-octene) and approximately the same molecular weight averages was synthesized to study the fractionation mechanism of HT-TGIC. A systematic study of HT-TGIC operation conditions (heating rate, heating flow rate and cooling rate) was done for three copolymer samples and their blends to investigate the impact on peak shape and position. In addition, different commercial Hypercarb® columns (having distinct length, and particle size) were compared to study the influence of column type on HT-TGIC fractionation.