Understanding solution fractionation of polyolefin: what we have learn from modeling.

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During the last few decades, several polyolefin chracterization techniques have been developed to response to the demand of polyolefin industry, which require faster, more efficient, and more acurate characterization of polyolefin with increasingly more complex structures. Techniques to characterize chemical composition distribution (CCD) have evolved from conventional and tedius temperature rising elution fractionation (TREF) to a faster crystallization analysis fraction (CRYSTAF) and even more efficient and reliable crystallization elution fractionation (CEF), which can be used for high troughput CCD characterization.

Besides those with crystallization based techniques, interaction liquid chromatography (LC) techniques have also been considerably improved to high temperature thermal gradient interaction chromatography (HT-TGIC) with a graphitic carbon column, which allow chracterization over much wider comonomer range within a fast analysis time. Moreover, the shift from solvent gradient to temperature gradient also allows additional online monitoring using other chracterization techniques.

Our research group has focused on understanding the underlying fractionation mechanism of these techniques, leading to the explainations of several phenomena during characterization, such as the role of kinetic effect (crystallization/elution and adsorption/desorption kinetics) on the characterization results, axial dispersion phenomena during the elution step of DC analysis and its absence in both TREF and CEF, explaination of TREF results of linear olefin block copolymers (OBC). This presenation reviewed the general outline of modeling approach we developed and summarized what we have learned from modeling works of several polyolefin characterization techniques.

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