Separation of polyethylene and polypropylene by adsorption liquid chromatography

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The most used techniques for determination of the chemical composition distribution of polyolefins are TREF and CRYSTAF. Both are based on crystallization, i.e., amorphous samples cannot be selectively separated. Application of HPLC techniques may speed up the analysis of the chemical composition distribution of polyolefin materials [1-6]. Moreover, it may deliver information about the amorphous fraction of polyolefin samples; the first examples of such separation have recently been published: Blends consisting of isotactic, atactic and syndiotactic polypropylene as well as ethylene/1-alkene and propene/1-alkene copolymers could be separated according to either their tacticity [4] or their chemical composition [5,6].

With the aim to identify HPLC systems for the separation of polyolefins, we have tested several solvents as both the sample solvent and the mobile phase in combination with several sorbents, i.e., porous graphite, zirconium oxide covered with carbon and activated carbon. Sample dissolution, injector and column oven temperature were thermostated at temperatures between 100 and 160 °C depending on the solvent used.

Several new solvent-sorbent systems, which enable the adsorption and the following desorption of polyethylene and polypropylene were identified. It will be shown that some sorbent-solvent systems display different selectivity: For example, while isotactic polypropylene is retained in one sorbent/solvent system, it is not retained in another system. This is of interest for practical applications of HPLC analysis of polyolefins.

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References