

Title: A novel approach for evaluating the suitability of non-chlorinated solvents for liquid adsorption chromatography of polyolefin elastomers

Main Author:

Name: Subrajeet Deshmukh
Organization: Fraunhofer Institute for Structural Durability and System Reliability, Division Plastics, Department Material Analytics and Characterization, Schlossgartenstr. 6, 64289 Darmstadt
Country: Germany

Co-Authors:

Jan-Hendrik Arndt

Co-author 1:
Organization: Fraunhofer Institute for Structural Durability and System Reliability, Division Plastics, Department Material Analytics and Characterization, Schlossgartenstr. 6, 64289 Darmstadt
Country: Germany

Co-author 2:
Organization: Fraunhofer Institute for Structural Durability and System Reliability, Division Plastics, Department Material Analytics and Characterization, Schlossgartenstr. 6, 64289 Darmstadt
Country: Germany

Co-author 3:
Organization: Arlanxeo Netherlands B.V.
Country: The Netherlands

Co-author 4:
Organization: Arlanxeo Netherlands B.V.
Country: The Netherlands

Co-author 5:
Organization: Fraunhofer Institute for Structural Durability and System Reliability, Division Plastics, Department Material Analytics and Characterization, Schlossgartenstr. 6, 64289 Darmstadt
Country: Germany

Co-author 6:
Organization:
Country:

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Abstract:

In Liquid Adsorption Chromatography (LAC), there is a constant drive to improve the separation capabilities and to find environmentally better solvents to characterize detailed features of the chemical composition distribution. One way to achieve this is by a trial-and-error approach of combining adsorption and desorption promoting solvents. LAC of polyolefins, using porous graphite (Hypercarb™) as a stationary phase has seen a remarkable growth since its inception in 2010. Nonetheless, studies focusing on the polyolefin elastomer ethylene propylene diene terpolymer (EPDM) are rare, with regards to the exploration of different solvents and stationary phases.

In this research work, LAC of EPDM terpolymers was carried out on Hypercarb™ by investigating benzene derivatives as mobile phase. Structure-retention relationships (SRRs) were developed for several substituted aromatic solvents which were classified as either adsorption or desorption promoting ('adsorli' and 'desorli' solvents, respectively). Subsequently, by combining the SRRs with a simplified form of the Hansen Solubility Parameters (HSPs), a predictive tool for solvent selection in LAC of EPDM was created. For the first time, instead of the conventional chlorinated aromatic desorlis 1,2,4-trichlorobenzene (1,2,4-TCB) and 1,2-dichlorobenzene (ODCB), two new non-chlorinated desorlis were identified, namely tetralin and 1,2,4-trimethylbenzene. This resulted in improved chromatographic resolution of EPDM terpolymers varying in chemical composition.