

Towards HYPERformance Polymer Separations

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The prevailing trend in liquid chromatography is the progression towards smaller (sub-2 μm) particles and higher pressures (100 MPa or higher). We have come to use the designation ultra-high-performance liquid chromatography (UHPLC) for this mode of operation. Other important developments in LC include the use of monolithic and core-shell (superficially porous) particles. All these developments seem to be neglected in the field of polymer separations.

The main purpose of this lecture is to discuss whether and how developments in LC may be used in polymer separations. It will be demonstrated that UHPLC can have significant benefits for polymer separations. A greater choice of columns would be needed to make full use of these benefits. There also is a need for modifications in instrumentation, such as the detectors we like to use for characterizing polymers.

In one aspect polymer separations are very much at the front of developments in LC. This is the application of comprehensive two-dimensional liquid chromatography (LC \times LC). Polymer samples are complex (many different molecules), but they have a low sample dimensionality (few parameters suffice to characterize the most-important differences between these molecules). Therefore, structured (LC \times LC) chromatograms can often be obtained for synthetic polymers. It will be demonstrated that UHP (LC \times LC) may lead to 10-fold shorter analysis times than conventional LC \times LC.

Finally, it will be discussed how LC, LC \times LC, and perhaps even LC \times LC \times LC of polymers may be taken to the next level, that of HYPERformance LC.