

Understanding Axially Non-Uniform Chromatographic Systems

Chromatography is a separation technique that is widely used in the chemical and pharmaceutical industry, environmental studies, food safety, biological research and forensics. Ever increasing separation power is pursued to analyze more complex samples at a higher throughput. To increase the separation power, several tracks are pursued. In liquid chromatography (LC), the most straightforward method to increase speed and efficiency of the separation is to increase the operating pressure. Alternatively, supercritical fluids (SF) can be used as a separation medium, having similar densities and solubility's as liquids but a much lower viscosity. However, using SF, separation parameters are strongly affected by the local pressure in the column and hence will vary along the column axis. This axially non-uniformity will greatly complicate the resulting behavior of the chromatographic system.

A LC set-up has been built which allows to operate up-to 2600 bar. The system was fully characterized and the possibilities and limitations in terms of operating pressure were investigated. The behavior of supercritical fluids was investigated, both experimentally as well as theoretical modelling, to allow a deeper insight in the fundamental behavior of SF-based chromatography.