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Reduction of solvent usage in HPLC during column re-equilibration after gradient elution in Reversed-Phase Liquid Chromatography

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High performance liquid chromatography (HPLC) is arguably the most important analytical tool in the pharmaceutical and related industries, and many applications require the use of gradient elution in which the volume percentage of strong ("B") solvent is increased during the separation. To repeat an analysis following gradient elution, the final mobile phase in the column (final %B) must be replaced with the original mobile phase (initial %B), and this process is known as column re-equilibration. A rule of thumb in reversed-phase liquid chromatography (RPLC) is that column re-equilibration requires at least 10-15 column volumes of the original mobile phase in order to obtain reproducible results using gradient elution, and this volume of mobile phase can be significant in a lab where the number of gradient elutionanalyses conducted per day is large, particularly when the HPLC columns with traditional lengths of 15 cm or more and inner diameters of approximately 4-4.6 cm are employed.

The purpose of the present study is to investigate whether, using a kinetic model,selected experimental conditions including but not limited to flow rate and temperature can be optimized in such a way as to reduce the volume of original mobile phase needed to achieve column re-equilibration from 10-15 column volumes to only 3-4 column volumes, thus achieving a reduction of solvent usage of up to 80% during this step. The results of our experiments with numerous RPLC columns of varying stationary phase chemistry, particle size, pore size, and inner diameter will be described.

Biography

Joe Foley is Professor of Chemistry and Associate Department Head at Drexel University, and currently serves on the editorial boards of Bioanalysis and Electrophoresis. He received his Ph.D. in Chemistry from the University of Florida, and followed it with a 2-year NRC postdoc at NIST. His research interests are in the fundamental and applied aspects of analytical chemistry and separation science, and he has authored or co-authored over 110 articles, book chapters, critical reviews, and one patent pertaining to pressure- and voltage-driven liquid-phase chiral and achiral separations (i.e., HPLC, UHPLC, SFC, and CE/EKC).

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