

Multi-Dimensional Liquid Chromatography: Principles, Practice, and Applications

Abstract

Many industries are developing increasingly complex products, whose separation requires substantially more resolving power than that offered by state-of-the-art one-dimensional liquid chromatography. Two-dimensional liquid chromatography (2D-LC) techniques meet that need and are finding ever more application to the analysis of samples of moderate to high complexity.

This tutorial will cover:

- **Concepts** of the technique including the theoretical underpinnings of the advantages of 2D separations over their conventional 1D-LC counterparts.
- **Practical aspects** of modern 2D-LC that are critical for the development of successful separations including experimental details, column selection, and the management of the interface between the two separation dimensions.
- **Applications** of 2D-LC described in the literature that address problems in a variety of industries ranging from the analysis of small molecular weight compounds to polymers, which can be chemical as well as biological in nature.
- **Recent trends** towards MD-LC that, by adding further dimensions, allow for deep insights into the structure of biomolecules and have the potential for more automation in analytical workflows.

Biography Dwight Stoll

Dwight is Professor of Chemistry at Gustavus Adolphus College. He has authored or co-authored 85 peer-reviewed publications, six book chapters, and one book in separation science, and more than 100 conference presentations. His primary research focus is on the development of two-dimensional liquid chromatography (2D-LC) for both targeted and untargeted analyses where he made contributions on many aspects of the technique including stationary phase characterization, biopharmaceutical analysis, new 2D-LC methodologies and instrumentation, and fundamentals. Dwight obtained his Ph.D. from the University of Minnesota in 2007, where he worked on the “Development of Fast, Comprehensive Two-Dimensional Liquid Chromatography” in the group of Prof. Dr. Peter Carr. He is the recipient of LCGC’s Emerging Leader in Chromatography Award (2011), the American Chemical Society Division of Analytical Chemistry Award for Young Investigators in Separation Science (2015), and the Georges Guiochon Faculty Fellowship (2017).

Biography Stephan Buckenmaier

Stephan is Principal Research Scientist at Agilent Technologies. He has authored or co-authored about 40 publications and technical overviews and over 50 external presentations. His primary focus is on the development of multi-dimensional liquid chromatography solutions including hardware, software, and applications. Other emphasis lies in collaborations with industry and academic institutions, education on separation techniques, and internal coaching and mentoring. Prior to Agilent, where his career began as an LC/MS Application Scientist in 2006, he was a Postdoctoral Researcher in the Proteome-Center of the University of Tübingen (Germany), where he studied diagnostic proteins and post-translational modifications. Stephan obtained his PhD at the University of the West of England (Bristol, UK) in 2004, where he investigated “Factors influencing Retention and Peak Shape in Reversed Phase HPLC” in the group of Prof. Dr. David McCalley in collaboration with Dr. Melvin Euerby (AstraZeneca, Loughborough, UK). Passionate about separation science, he studied the application of GC, CE, CEC, LC, and MS in a range of disciplines including environmental-, food-, (bio-)pharmaceutical-, and chemical analyses.