



Foreword

Most samples do not present themselves in a form that is suitable for chromatographic analysis. Since the most common methods of sample introduction in chromatography require the sample to be dissolved in a solvent dissolution is the most common sample preparation procedure. Extraction methods employ solvents for dissolution, isolation, matrix simplification, and concentration, all of which are actions that facilitate the preparation of samples suitable for chromatographic analysis.

The unit operations of extraction have been heavily researched for over a century and continue to undergo evolutionary and revolutionary changes. At the turn of the present century the dominant direction of sample preparation methods was solid-phase extraction. These methods were often promoted as a replacement for liquid extraction techniques that were characterized by the use of large solvent volumes and operational steps that were difficult to automate, and so remained labor intensive. The first decade of the present century has seen a rebirth of interest in liquid extraction methods but now in a miniaturized form. The realization of operational benefits by down scaling of the extraction solvent in the form of a microdrop or immobilized film in a variety of formats is driving this interest. Solvents retain the upper hand with respect to possessing more reproducible properties combined with a wider range of solvation properties, and when adapted to the new miniaturized formats, provide favorable sample utilization with minimal waste. New solvents based on ionic liquids and fluorinated media are gaining increasing interest as a way to expand the extraction characteristics of conventional organic solvents. The use of environmentally friendly solvents is being explored as a contribution to reducing the adverse impact of laboratory sciences on the environment.

Recent trends in solid-phase extraction play to the strengths of adsorption systems among which ease of separation from the sample matrix, ease of automation, utilization and reutilization of exotic adsorbent chemistries, and generally low costs. New approaches to solid-phase extraction stress miniaturization of the

sampling process which facilitates automation and faster sampling procedures as well as providing new applications to samples only available in small sizes. More exotic materials based on the high specificity associated with biological interactions are facilitated when adapted to the solid-phase extraction mode. The direction of research is shifting away from non-specific adsorbents to greater use of class specific or even analyte specific sorbents for high sample throughput applications.

The newer sampling procedures also take advantage of modern methods of coupling energy into the sample system to enhance the efficiency of the extraction process and reduce the time required to prepare samples. Solvents operated under non-conventional conditions of higher temperatures and above ambient pressures are more effective at competing with the sample matrix facilitating the more complete recovery of analytes. Microwave and ultrasound methods are more effective at disrupting the sample matrix and heating samples than conventional methods employing hot plates and stirrers.

There is no indication that the developments in sample preparation for chromatographic are approaching maturity as indicated by the many articles found in this journal discussing new techniques and their applications. Some of these methods may have a limited shelf life and destined to be quickly replaced in the evolutionary chain of sample preparation methods. This is simply an indication of a dynamic area of contemporary research and discovery. The purpose of this special issue is to capture a picture of the rapidly developing technique of extraction for the benefit of those working in the field presently and to provide a starting point for those with interests or needs not currently met by conventional approaches to identify and pursue new ideas furthering the evolution of sample preparation techniques for chromatographic analysis.

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