
SAMPLE PREPARATION TECHNOLOGY: PRESENT STATUS AND FUTURE HYPHENATED IMPLEMENTATIONS

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Sample preparation is a time-consuming component of chemical analysis that adds significantly to the cost and potential error of a method. Attempts to address this have included efforts not only to develop faster and more convenient and faster approaches, but also to hyphenate this step with instrumental techniques. The talk will summarize the fundamental aspects of sample preparation and anticipate future developments focusing on hyphenation with chromatography and mass spectrometry. The sample preparation step in an analytical process typically consists of an extraction procedure which results in the isolation and enrichment of components of interest from a sample matrix. Extraction can vary in degree of selectivity, speed, and convenience and depends not only on the approach and conditions used, but on the geometric configurations of the extraction phase. Increased interest in sample-preparation research has been generated by the introduction of non-traditional extraction technologies. These technologies address to various degree the need for reduction of solvent use, automation, hyphenation and miniaturization, and ultimately lead to on-site *in-situ* and *in-vivo* implementation. These extraction approaches are frequently easier to operate, but provide optimization challenges. More fundamental knowledge is required by an analytical chemist not only about equilibrium conditions but, more importantly, about the kinetics of mass transfer in the extraction systems. Proper design of the extraction devices and procedures facilitates convenient on-site implementation, integration with sampling and separation/quantification and/or automation. The key to rational choice, optimization, and design of hyphenated systems is an understanding of the fundamental principles governing mass transfer of analytes in multiphase systems.