

## Role of Aqueous and Mobile Phase in Improving Sensitivity and Selectivity in Analytical Chemistry

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### INTRODUCTION

In chromatography, the mobile phase and aqueous phase are two essential components used in separating mixtures of compounds. The mobile phase is a liquid or gas that moves through a chromatographic column, carrying the sample being analyzed. The aqueous phase is a liquid used in liquid-liquid extraction and is typically water-based. Both phases are critical for the success of the chromatography process, and their selection plays a crucial role in the separation of the sample components.

### Mobile phase

The mobile phase is a solvent or a mixture of solvents that flows through a chromatographic column carrying the sample being analyzed. The mobile phase interacts with the stationary phase, which is a solid or a liquid-coated on a solid support, to separate the components of the sample.

There are two types of mobile phases: Liquid and gas. Liquid mobile phases are commonly used in Liquid Chromatography (LC), while gas mobile phases are commonly used in Gas Chromatography (GC).

In liquid chromatography, the mobile phase can be either polar or nonpolar. A polar mobile phase, such as water or a water-based solvent, interacts with polar compounds in the sample, while a nonpolar mobile phase, such as hexane or methylene chloride, interacts with nonpolar compounds in the sample. The choice of mobile phase depends on the polarity of the sample components and the stationary phase. For example, if the stationary phase is polar, a nonpolar mobile phase is used, while if the stationary phase is nonpolar, a polar mobile phase is used.

Gas chromatography typically uses a nonpolar mobile phase, such as helium or nitrogen gas, to separate nonpolar compounds in the sample. The choice of gas mobile phase

depends on the size and boiling point of the sample components. The gas must be able to volatilize the sample components, allowing them to pass through the column.

### Aqueous phase

The aqueous phase is a liquid used in liquid-liquid extraction to separate compounds from a mixture. It is typically water-based and interacts with the sample components based on their solubility in water.

In liquid-liquid extraction, the sample is mixed with an aqueous phase and an organic phase. The aqueous phase is typically water-based and interacts with the polar components of the sample, while the organic phase interacts with the nonpolar components of the sample. The choice of aqueous phase depends on the polarity and solubility of the sample components. For example, if the sample components are polar and water-soluble, an organic solvent is used as the organic phase, while if the sample components are nonpolar and water-insoluble, a water-miscible organic solvent is used as the organic phase.

The aqueous phase is also used in ion-exchange chromatography, which separates ions based on their charge. The stationary phase in ion-exchange chromatography is typically a resin with charged functional groups. The aqueous phase is used to wash the stationary phase, removing unwanted ions and allowing the desired ions to bind to the functional groups.

In summary, the mobile phase and aqueous phase are two essential components used in chromatography to separate mixtures of compounds. The choice of mobile phase and aqueous phase depends on the polarity, solubility, and size of the sample components and the stationary phase. Proper selection of these components is critical to the success of the chromatography process.

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