The Dance of the Molecules

How contamination and evaporation mess up your chromatograms

HPLC: pleasure or frustration?

High-performance liquid chromatography **(HPLC)** and ultra-high-performance liquid chromatography **(UHPLC)** are essential tools in analytical chemistry that provide deep insights into the structure and composition of chemical compounds.

However, even in the most meticulous laboratories, an invisible "choreography" of solvent evaporation and contamination can turn the chromatogram into some kind of hurricane. If this frustrating experience reaches a certain level, you might sooner or later feel a temptation to blow up your whole analytical setup.

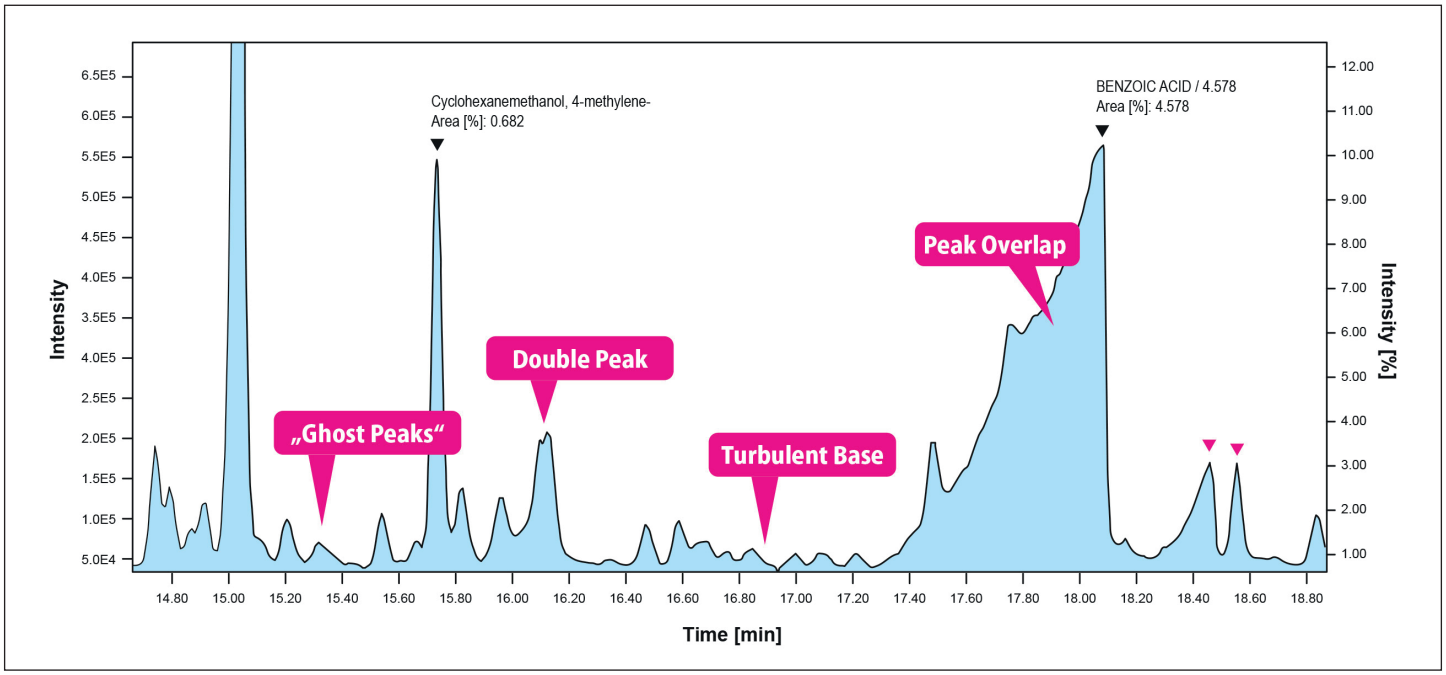
Contamination of eluents

In the precise world of HPLC / UHPLC, even the **slightest** contamination of the solvent can have a critical impact. The chromatogram, which serves as a visual representation of the separation of compounds, can be disrupted by **unwanted peaks** ("ghost peaks"), **baseline instability**, and **distortions**. These irregularities make accurate quantification and identification of compounds extremely difficult.

It is not for nothing that we speak of a **clean and distinct separation** in chromatography. Especially when the peaks you are aiming for are close together or overlapping (i.e. are **not** distinctly separated), even the smallest impurity will become a problem - and the litterbug rages in your chromatogram.

SCAT Safety Caps with ventilation valve and integrated air filter provide a **clean and contamination-free** airstream into your solvent reservoir.

If you need an even more special environment for your solvents, you can also use particle filters with a specific pore size, moisture or special bio filters, depending on your individual application. Simply attach them to the valve by using the integrated Luer-Lock connection.



Picture 1: *Some example peak forms that complicate a distinct separation, identification and quantification.*

Evaporation of solvent mixtures

Evaporation is a stealthy actor that changes the stage setting. During analysis, **volatile** components can evaporate **faster** than others, leading to imbalances in the dissolved sample. This can lead to fuzzy peaks, reduced resolution and even irreversible damage to the column.

This messes up the molecular harmony that a chromatogram strives for. The accuracy and reproducibility of the analysis suffer.

If you work with a **gradient system** (in contrast to **isocratic** analysis), the mixing ratio can be adjusted automatically over the course of the analysis.

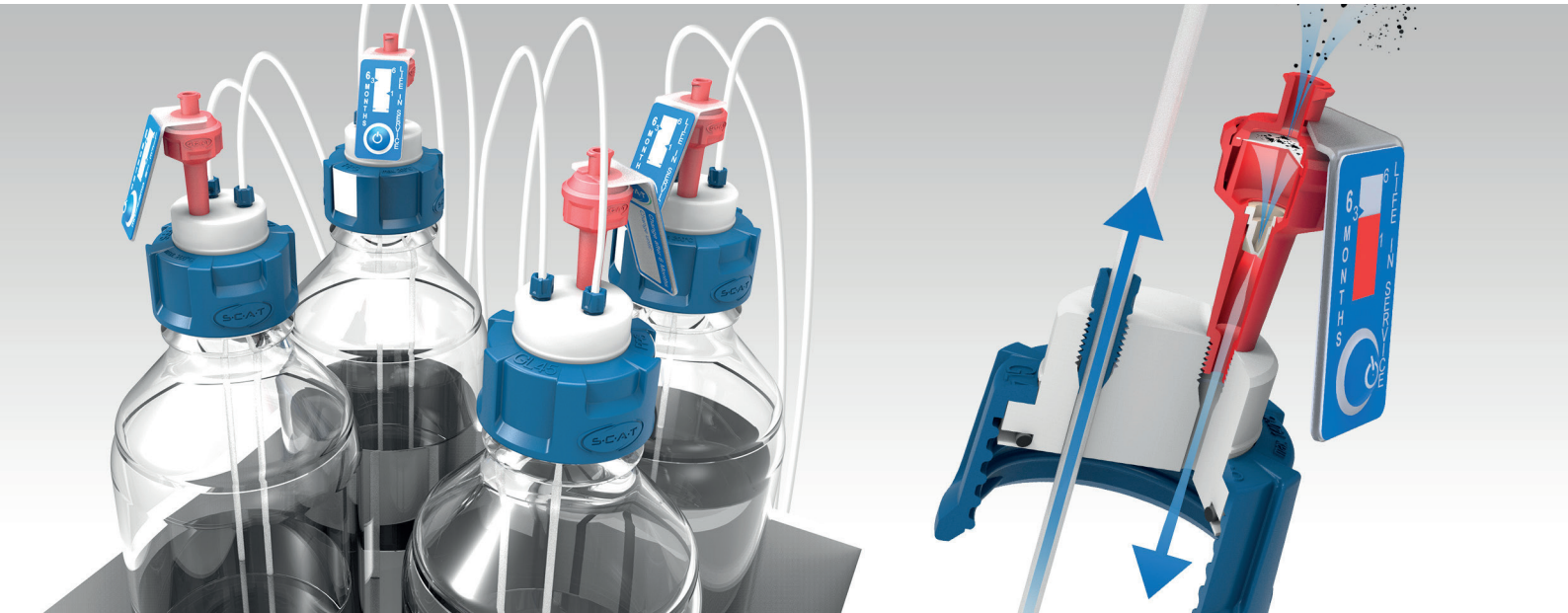
However, this assumes that your system has automatic **gradient control** capabilities for mix ratio changes. It monitors the **refractometer** or **detector response** and adjusts the mixture accordingly.

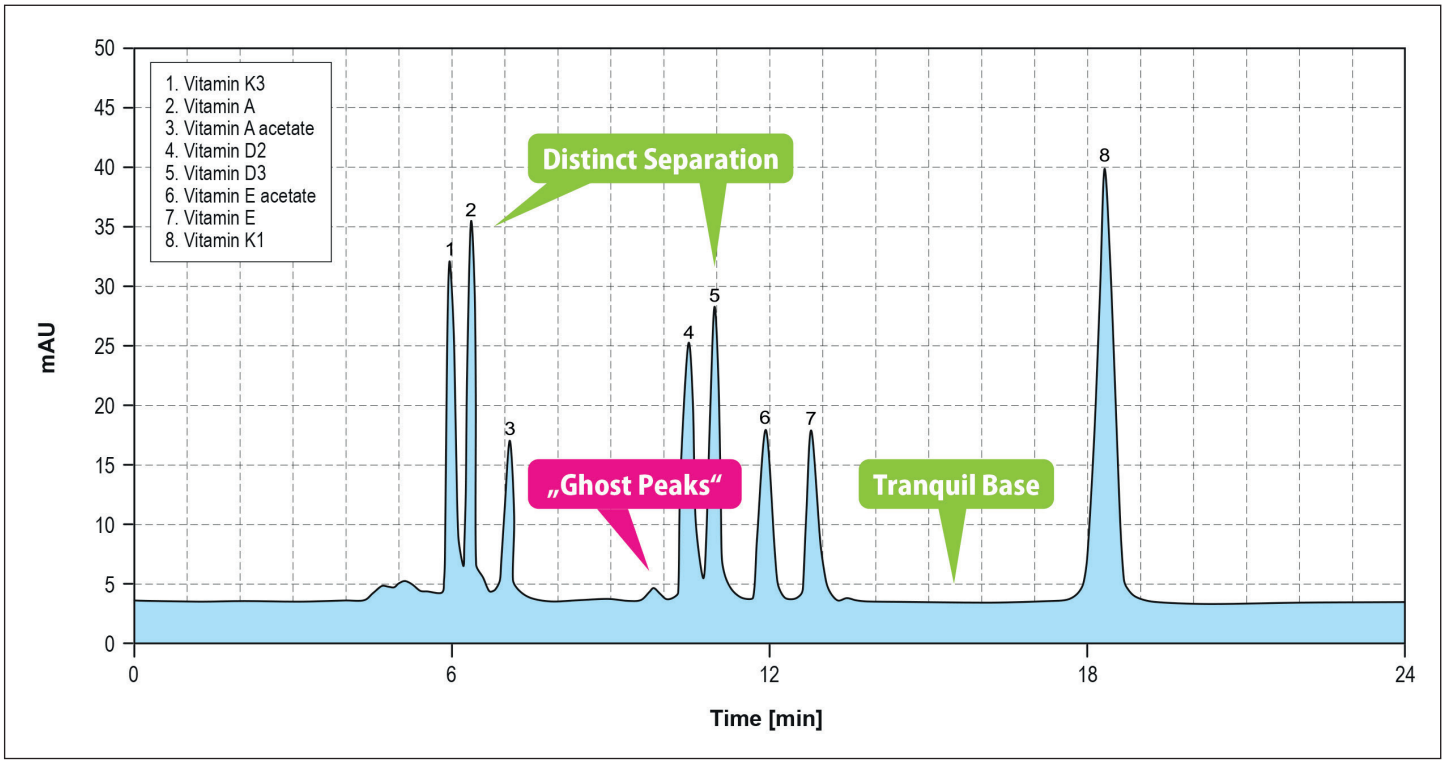
However, the necessary calibrations add complexity to the method and not all changes can be anticipated. A **closed system** for solvent delivery and disposal saves you this effort and eliminates a critical factor from your gradient control.

This will only work if the eluent supply is **hermetically sealed** so that everything stays where it should: inside the storage bottle.

To ensure that there is no negative pressure during removal, SCAT Safety Caps compensate for pressure differences with their integrated ventilation valve. Fresh air can get in, but no fumes out - so there will again be harmony in the foyer of your HPLC theater.

Picture 2: *Safety caps with ventilation valve and air filter for clean pressure equalization during solvent supply to your HPLC.*





Picture 3: *Even with the most careful analysis, ghost peaks or impurities can appear. The "perfect" separation is rarely achieved. In addition to good method development, however, many disruptive factors can be reduced to a minimum by clean solvent and sample preparation.*

Safe solvents as part of good HPLC method development

There is a lot to consider when developing an HPLC method: the right **column**, the right **solvent**, **temperature**, **pressure**, **detection wave** and other influencing factors are undoubtedly important.

But a **clean solvent supply** without evaporation is just as important as these parameters. Even the most meticulous method can be thrown off balance by contaminated solvents. Unpredictable and unreliable results are the consequences. The more precise the analysis, the more serious the impact of a single dirt particle.

Other impacts of contamination and evaporation

Aside from the obvious effects on the chromatogram and analysis results, contamination and evaporation can cause subtle but significant problems. For example, **column stability** can be compromised, leading to a shorter lifetime and thus higher **costs**. Those who are not running some kind of „Mickey Mouse“ analysis know what a good and suitable column will cost.

In addition, the **reproducibility** of the method can be impaired, which makes it difficult to transfer it between different laboratories or devices. Ultimately, evaporation and contamination threaten the accuracy and reliability of HPLC / UHPLC analysis like an invisible hand.

Anyone who understands the interaction of **clean, stable solvents** with the other parameters of reliable analysis can move safely in the fascinating world of HPLC / UHPLC. It is only by paying careful attention to these „invisible“ factors that the scientific dancers in the lab can pull off a precise tango - and achieve the reliable results they seek.

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