

Vial material – the invisible success factor

The material properties of the vial are strategically important because they have a significant impact on the success of an analysis. This article provides an overview of the key strengths and limitations of different material classes, thereby laying the foundation for selecting the right material for the application.

Borosilicate glass as the gold standard for chemical and thermal stability

Borosilicate glass of hydrolytic class 1 is the first choice for organic chemistry, trace analysis and high-temperature applications. Its stable, three-dimensional silicate network structure ensures unrivalled chemical inertness and extreme temperature resistance from -196 °C to over 300 °C. It is the only material that allows dry hot air sterilisation at over 250 °C for pyrogen-free processes. The biggest challenge is its polar surface: the free silanol groups (Si-OH) can lead to significant adsorption in valuable protein and peptide samples due to electrostatic interactions. Furthermore, due to its melting point, borosilicate glass is not compatible with standard glass recycling and must be disposed of separately, even without chemical contamination.

Silanised glass and polypropylene as a solution against protein adsorption

Silanised glass is a proven high-performance solution for circumventing the problem of protein adsorption. Pharmaceutical polypropylene (PP) offers an economical alternative. Its hydrophobic surface significantly reduces protein binding. However, this advantage requires precise knowledge of the analyte: while most proteins benefit, highly hydrophobic peptides such as insulin or GLP-1 may show a higher affinity for PP than for glass. The mechanical flexibility of PP also absorbs stress caused by repeated freeze-thaw cycles and prevents material fatigue, which is an important advantage, especially for handling aliquots. Nevertheless, unavoidable limitations clearly define its area of application: the material is restricted to a temperature range of approximately -20 °C to +135 °C, is unsuitable for aggressive organic solvents and, as a milky material, is not designed for optical analyses.

The right vial for your application!



Glass - maximum purity, chemical inertness and thermal resistance.



PP - flexible, cost-effective choice for biologics and routine testing.



TPX - chemically inert, transparent and ideal for MS analysis.



Polymethylpentene (TPX) as a transparent high-performance alternative

Polymethylpentene (TPX) is used in applications where the chemical or thermal resistance of PP is insufficient, but a plastic solution is required. It is transparent like glass and also has a higher thermal stability than PP. Its operating range is from -40 °C to +120 °C and can be extended to up to 170 °C for short periods. Its chemical resistance exceeds that of PP, and its extremely inert adsorption behaviour makes it the ideal choice even for the most demanding peptides in mass spectrometry. While it has a significantly higher breaking strength than glass, it is harder and more brittle at room temperature than flexible PP, which requires careful handling.

The choice of vial is therefore a strategic decision. Borosilicate glass is the universal standard for inertness, purity and thermal stability.

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