

# Glass Abdicates the Throne... and LoBind Becomes the New King of Proteomics

Rafal Grzeskowiak, Eppendorf SE, Germany

The adsorption problem – when glass works against you

Peptide and protein adsorption to consumable surfaces is a well-recognized but often underestimated source of error in analytical chemistry, proteomics and molecular biology. When peptides adhere to the walls of tubes or vials, their concentration decreases, leading to inaccurate quantification, distorted protein abundances, and risk of false-negative findings.

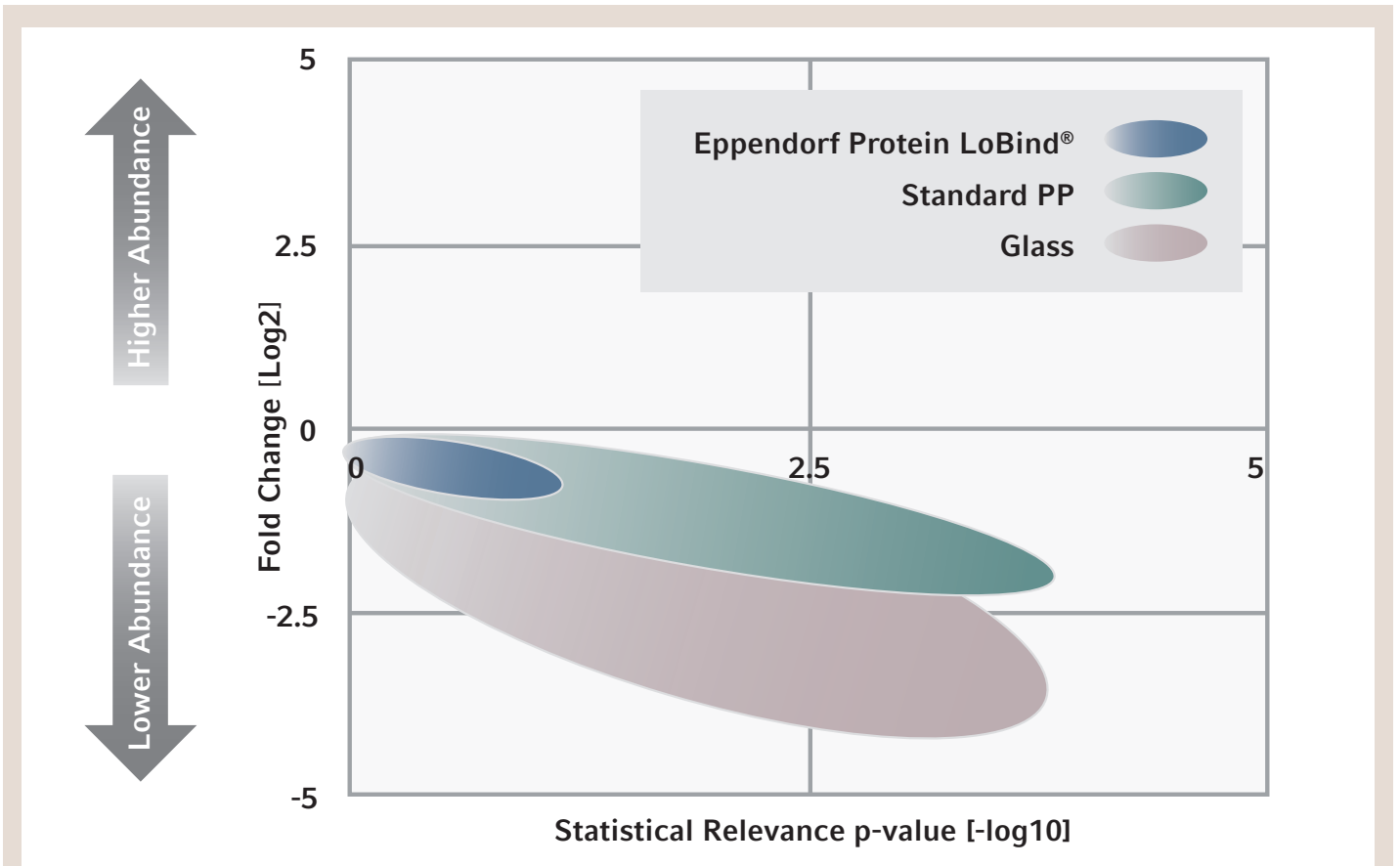
Glass vials have traditionally been regarded as the safest and most inert choice for analytical and proteomic workflows due to their chemical resistance and long-standing use in chromatography. Recent studies employing high-resolution adsorption profiling with the Assay for Characterizing Adsorption-Properties of Surfaces (APS), demonstrate, however, that glass vials – despite their long-standing reputation – show the highest levels of peptide adsorption [1]. After 24 hours of incubation, up to 23 % of peptides were depleted due to strong electrostatic attraction between positively charged peptides and



the negatively charged glass surface, often reinforced by secondary hydrophobic interactions (Fig. 1). This extensive loss alters peptide profiles and can severely compromise the reliability of proteomic analyses.

As shown in this paper, standard polypropylene (PP) tubes perform better than glass, but still show notable adsorption, especially for hydrophobic peptides. Although PP lacks the negative surface charge of glass, its hydrophobic nature promotes interaction with long, non-polar peptides, leading to measurable analyte loss (Fig. 1).

Consequently, while standard PP reduces adsorption compared to glass, it remains insufficient for workflows with small sample amounts and applications that require highly accurate peptide or protein quantification – stressing the need for materials specifically engineered to minimize adsorption.



**Figure 1:** Abundance shift of a 3,531-peptide mixture after 24 h incubation in different tube materials. The cloud plots illustrate the extent and statistical significance of peptide adsorption. Glass vials exhibit the largest and most pronounced negative abundance shift, consistent with strong electrostatic and secondary hydrophobic binding. Standard PP tubes also show a substantial depletion, driven mainly by hydrophobic peptide loss. In contrast, Protein Low-Binding Tubes (Eppendorf Protein LoBind® PP) display only a very small and statistically insignificant shift, indicating that virtually no peptides were adsorbed during incubation.

## Eppendorf LoBind Protein Polypropylene

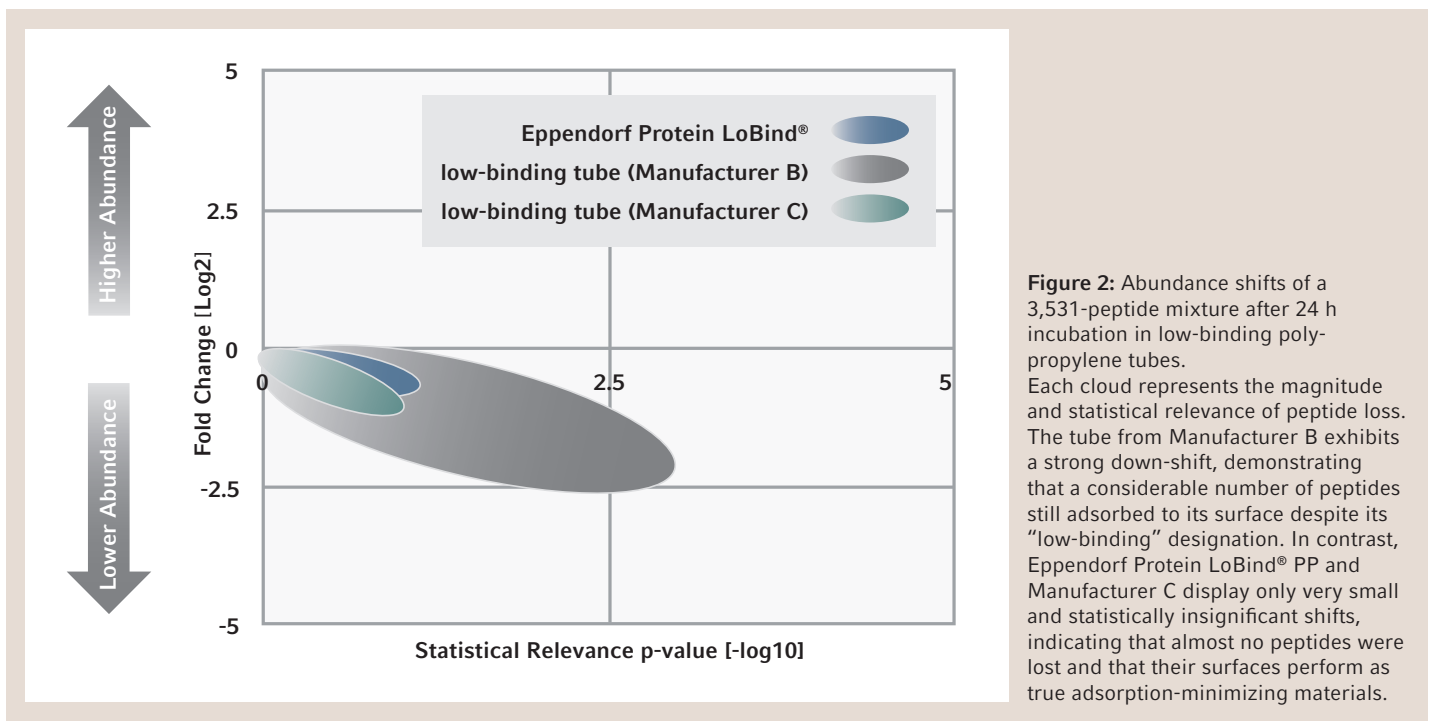
Many suppliers market tubes as “protein low-binding,” yet as the APS data shows, these products differ substantially in their actual adsorption behavior. In Figure 2, three low-binding PP materials were compared:

Eppendorf Protein LoBind PP and two other manufacturers: after 24 hours of incubation with a 3,531-peptide sample, tubes from Manufacturer B still showed significant adsorption (42 peptides) – a profile similar to standard PP. In contrast, Manufacturer C and Eppendorf Protein LoBind PP exhibited no statistically significant peptide loss, demonstrating true low-adsorption performance.

These results make it evident that the designation “low-binding” is not consistent across suppliers. Differences in polymer formulation, surface-modification chemistry, and manufacturing processes lead to pronounced performance

variability. Only materials specifically engineered and validated with thousands of peptides reliably achieve adsorption-resistant behavior.

Among all low-binding materials tested, Eppendorf Protein LoBind PP demonstrated the most consistent and effective reduction in peptide binding. Its optimized, specifically engineered polypropylene minimizes both electrostatic and hydrophobic interactions, ensuring that peptide mixtures retain their full composition during handling and storage. APS measurements showed no detectable peptide depletion in Eppendorf Protein LoBind tubes even after 24 hours of incubation. This near-zero adsorption performance preserves sample integrity and establishes Eppendorf Protein LoBind tubes as the benchmark for sensitive, quantitative proteomics workflows.



## Impact and Practical Conclusions

Selective peptide adsorption directly distorts protein quantification in bottom-up proteomics. When peptides bind to tube surfaces, their measured intensity decreases, making proteins appear falsely downregulated. APS results clearly show that glass and standard PP both cause substantial peptide loss and significant underrepresentation of specific protein/peptide types. In contrast, Protein LoBind PP preserves peptide profiles with high fidelity, preventing artefacts – especially critical in low-input or highly sensitive workflows.

APS establishes a clear material hierarchy:

- > Glass should be avoided: adsorption is extensive and introduces major quantification bias
- > Standard PP is acceptable only for robust, high-abundance assays and still poses risk of significant underrepresentation of long, non-polar peptides
- > Engineered low-binding PP, particularly Eppendorf Protein LoBind, reliably prevents adsorption and ensures accurate, reproducible quantification.

Overall, the assumption that glass is the most inert material is outdated. APS data show that properly engineered low-binding polypropylene is now the most reliable choice for modern proteomics.

## Conclusion

APS findings clearly demonstrate that Eppendorf Protein LoBind tubes outperform glass and standard PP by providing minimal peptide adsorption, stable recovery, and accurate protein quantification. By eliminating surface-induced artefacts, LoBind PP supports more reproducible and

trustworthy proteomics workflows. For researchers requiring high-performance, adsorption-resistant consumables, LoBind tubes represent the new gold standard – effectively replacing glass in sensitive analytical applications.

## References

[1] Bente Siebels et al. (2024), Assay for Characterizing Adsorption-Properties of Surfaces (APS), Chemistry – A European Journal

## About Eppendorf

Since 1945, the Eppendorf brand has been synonymous with customer-oriented processes and innovative products, such as laboratory devices and consumables for liquid handling, cell handling and sample handling. Today, Eppendorf and its approximately 4,500 employees serve as experts and advisors, using their unique knowledge and experience to support laboratories and research institutions around the world. The foundation of the company's expertise is its focus on its customers. Eppendorf's exchange of ideas with its customers results in comprehensive solutions that in turn become industry standards. Eppendorf will continue on this path in the future, true to the standard set by the company's founders: that of sustainably improving people's living conditions.

**Your local distributor:** [www.eppendorf.com/contact](http://www.eppendorf.com/contact)

Eppendorf SE · 22339 Hamburg · Germany  
[eppendorf@eppendorf.com](mailto:eppendorf@eppendorf.com) · [www.eppendorf.com](http://www.eppendorf.com)

[www.eppendorf.com](http://www.eppendorf.com)