

Proteins Filtration – Choosing the Right Membrane - HPLC Primer

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Understanding Protein Filtration

In routine laboratory work, a filter's primary purpose is to remove undissolved particles, not to extract dissolved compounds such as proteins. The goal is to protect downstream instrumentation or improve sample clarity—not alter analyte concentration.

However, depending on the membrane type, proteins and other biomolecules may adhere to the filter surface. This occurs through:

- Hydrophobic interactions
- Ionic attraction
- Specific affinity interactions

This unintended adsorption can lead to lower analyte recovery or variability in quantitative workflows.

Membrane Adsorption & Steady State Behavior

Different membranes exhibit different adsorption capacities. When a solution is protein-rich, the membrane may become saturated quickly. Once all available binding sites are filled, the filter reaches “steady state,” meaning additional proteins pass through unaffected.

While this may eventually stabilize analyte recovery, it may not be suitable for quantitative studies, especially when:

- Sample concentration is low
- The membrane chemistry interacts strongly with proteins
- High reproducibility is required

Evaluating membrane compatibility is essential for method development.

When Filtration Is NOT the Right Technique

If the goal is to remove dissolved compounds—including proteins—filtration is not appropriate. Instead, consider:

- Solid Phase Extraction (SPE) – selective sorbents for targeted removal
- Centrifugation/Ultrafiltration – size-based separation
- Flash Chromatography or HPLC Prep Techniques – chemical selectivity
- Chromatography-impregnated membranes – which resemble filters but function through adsorption. One example is solid-phase extraction membrane, which captures analytes via sorbent-loaded layers instead of physical size exclusion.

Membrane Choice Matters

It's incorrect to assume that all membranes labeled the same (e.g., "nylon filters") behave identically. Different manufacturers use different formulations, treatments, and production methods, leading to variability in:

- Adsorption characteristics
- Flow rates
- Chemical compatibility
- Extractables and leachables
- Protein binding tendency

Testing multiple brands ensures the best performance for your application.

Guidance for Choosing a Membrane for Protein-Containing Samples

Here are general tendencies of common membranes:

- Low Protein Binding (Preferred for Protein Samples):
 - PVDF (hydrophilic)
 - PES
 - PTFE (with aqueous-compatible pre-treatment)
- Higher Protein Binding (Use With Caution):
 - Nylon
 - Cellulose acetate
 - Cellulose nitrate

Selecting a membrane with low protein affinity helps prevent sample loss and improves consistency.

Explore MICROSOLV™ Filtration Products

MICROSOLV™ offers a complete line of high-quality syringe filters and membranes designed for analytical sample preparation. [Learn more about our filtration products](#) or request guidance from our technical team.

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