

Chemical Compatibility of Chemical-Resistant Sealing Mats for the U-2D System - Tech Information

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Selecting the correct sealing mat is essential for maintaining sample integrity in plate-based micro-sample workflows (e.g., U-2D™ racks and inserts). This note summarizes the intended solvent domain for Chemical-Resistant (CR) Sealing Mats, where they excel, and where they should *not* be used, so you can set robust method boundaries and avoid seal degradation or analyte loss.

Compatibility at a Glance

- Generally compatible: Water, aqueous buffers, acids, bases, and *polar organic solvents* (as commonly used in HPLC/LC/MS labs). In routine analytical practice, this encompasses typical mobile phases and sample diluents.
- Generally incompatible: Hydrocarbon-based oils, fuels, and non-polar solvents (e.g., alkanes and many aromatic hydrocarbons). These can plastically swell or otherwise compromise the mat, raising risks of leakage or extractables.

Summary from the KB: “CR Sealing Mats have good chemical resistance to water, acids and bases, and polar solvents, but poor resistance to hydrocarbon-based oils, fuels and solvents... designed to work with most common HPLC solvents.”

Where CR Mats Excel (Recommended Use)

1. LC/LC-MS Mobile Phases & Dilutions

- Water / buffer / methanol systems
- Water / buffer / acetonitrile systems

CR mats are engineered for solvents typical of HPLC/LC-MS sample prep and autosampler staging, providing robust sealing without rapid swelling or leaching.

2. Aqueous Acid/Base Handling

Standard laboratory concentrations of acids or bases in water or polar solvent blends fall within the “good” resistance domain. Always operate within your site’s safety envelopes for pH and concentration.

When to Avoid CR Mats (Not Recommended)

- Non-polar/hydrocarbon solvents: e.g., hexane, heptane, toluene, certain mixed petroleum fractions, and fuels. These media can attack the mat polymer, causing loss of elasticity, seal failure, or potential contamination from absorbed/retained hydrocarbons.

Method-Development Guidance

To translate these compatibility boundaries into reliable practice:

1) Define the Solvent Envelope Upfront

Document every solvent (and range) that will contact the mat during prep → storage → analysis:

- Aqueous buffers (pH and ionic strength)
 - Organic % and identity (e.g., MeOH, ACN)
 - Any cleaning or wash steps that might contact the mat (including vapor exposure)
- This confirms the system remains in the “polar/aqueous” domain that CR mats are intended to handle.

2) Check for Non-Polar Exception Paths

Even if your sample matrix is polar, carryover from extraction steps or residual non-polar solvent films can undermine compatibility. If non-polar residues are unavoidable, swap to a covering strategy that does not expose CR mats to non-polar media (or stage samples until residuals are removed).

3) Validate Sealing Performance Under Real Conditions

Before production use, run a short stress series representative of your workflow:

- Fill select wells with worst-case solvent composition (highest organic %, lowest/highest pH).
- Incubate under typical time/temperature conditions for your queue (e.g., ambient staging, cooled autosampler, or modest warming).
- Inspect mats post-run for swelling, softening, odor, or visible deformation, and assess evaporation loss via gravimetric or level checks.
 - CR mats should maintain integrity and sealing performance for polar/aqueous applications; failure indicates unintended exposure or out-of-spec conditions.

4) Set Handling SOPs

- Avoid solvent pooling on the mat surface; wipe spills promptly.
- Minimize punctures (if using pre-slit patterns) to maintain low-evaporation performance.
- Replace mats showing discoloration, warping, or loss of elasticity; do not reuse a mat exposed to incompatible non-polar media.

Decision Flow (Quick Reference)

- Is your chemistry aqueous / acidic / basic / polar-organic (MeOH, ACN)?
→ Use CR mats (intended domain).
- Does your chemistry involve hydrocarbon oils/fuels/non-polar solvents?
→ Do not use CR mats; select an alternative cover strategy for that step.

Notes for U-2D™ Users The CR mat is a chemical-compatibility solution; it complements—not replaces—mechanical best practices of the U-2D system (correct handling, validated centrifuge limits with base+rack, avoiding unintended mechanical loads from stacked plates, etc.). Coordinate with your U-2D SOPs so that solvent compatibility and mechanical practices are jointly controlled. (Context aligns with broader U-2D KB guidance.)



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