

Care and Use Guide for Discovery Zr-PS

Discovery Zr-PS comprises spherical, porous zirconia particles with cross-linked polystyrene. It operates via a reversed-phase mechanism, but is less retentive, and can be used with 100% aqueous mobile phases. It has unique selectivity especially for aromatic compounds. Discovery Zr-PS complements the selectivity offering of the other zirconia-, silica-, and polymer-based Discovery phases, and allows the use of the full range of mobile phase pH from pH 1 to 13.

Discovery Zr-PS product specifications:

Particle composition: cross-linked polystyrene on zirconia
Particle size: 3 and 5 micron
Surface area: 30 m²/g
Pore size: 300 Å
pH range: 1 - 13
Temperature range: < 100°C (Note: Special column hardware for operations between 100 and 150°C is available. Please inquire to our technical service.)
Pressure range: 4500 psi maximum

Care – Recommendations to maximize column lifetime

We recommend you reproduce the test chromatogram supplied with the column. If your results deviate significantly, please contact our technical services for some troubleshooting suggestions. Routinely retesting your column throughout its lifetime will also make sure you are developing the best possible methods.

Protection: Use a guard column packed with the same material as in the analytical column. This increases column life by preventing both mechanical and chemical fouling. Use HPLC grade solvents. Filter samples and mobile phases and be sure buffer precipitation does not occur upon mixing mobile phase components. Always use fresh mobile phase and prevent or be alert for microbial growth. Use an in-line filter (0.5 micron) in front of column to catch large particulates. Minimize pressure surges.

Cleaning and regeneration:

Loss of efficiency or retention, or increased back pressure are indicators of column fouling. Carboxylic acids, fluoride, and phosphate all adsorb strongly to zirconia-based columns. They are easily removed by flushing the column with 20 column volumes of 0.1M ammonium hydroxide. If the column becomes fouled by adsorption of other compounds, you can attempt to remove the contaminants by flushing the column with 0.1M nitric acid at 50 – 90°C. The column can then be flushed with 0.1M ammonium hydroxide for 20 column volumes. When cleaned, the column should be flushed with 100% CH₃CN, CH₃OH, or isopropanol, then returned to normal operating conditions.

Column flushing and storage:

Discovery Zr-PS columns **should never be stored in phosphate buffers**. For overnight storage, flush the column with 50:50 organic modifier:water for storage overnight. For long-term storage, flush the column with 0.1M ammonium hydroxide first, followed by 50:50 organic modifier:water. Re-equilibrate in 50:50 organic modifier:water when the column is put back in service.

Use – Recommended operating conditions

Organic modifiers: Discovery Zr-PS is compatible with any commonly-used organic modifier for HPLC (THF, CH₃CN, CH₃OH, isopropanol). However, CH₃CN may give slightly better column efficiency. Do not exceed 50% THF. Because Discovery Zr-PS is much less hydrophobic than a silica-based C₁₈, it requires typically 20-25% less organic modifier to obtain roughly the same retention as you would on a typical silica-based C₈ or C₁₈. **Caution:** Do not use PEEK tubing at temperatures above 100 °C, or with THF containing mobile phases.

Temperature: Column efficiency is significantly better at higher temperatures. If compound stability permits, we recommended to run between 50 - 75°C. The columns are stable up to 100°C. Extended temperatures up to 150°C is permitted with special hardware.

Flow rates: Discovery Zr-PS particles give low backpressure compared to their silica counterparts. We suggest you take advantage of this and the high run temperatures by using a flow rate of 3mL/min to significantly reduce the run time. **Caution:** Do not use PEEK tubing at temperatures above 100 °C, or with THF containing mobile phases.

Buffers: It is always good practice to use buffers in the mobile phase when analyzing ionizable compounds by HPLC. For basic (cationic) compounds, we recommend phosphate, acetate, citrate, carbonate/bicarbonate buffers on Discovery Zr-PS, not the amine buffers (like TEA) used on silica columns. A good choice is 10 – 25 mM ammonium phosphate, pH 7. For LC/MS work, we recommend 10 – 100 mM ammonium hydroxide/ammonium fluoride buffers or ammonium hydroxide/ammonium formate buffers at pH 10 – 12. For carboxylated or other acidic (anionic) compounds, we recommend adding 5 mM ammonium fluoride to the mobile phase. A commonly-used mobile phase for carboxylates is 10 – 25 mM ammonium phosphate, 5 mM ammonium fluoride, pH 6 – 8. Selectivity is modifiable through the addition of a strong Lewis base to the mobile phase such as fluoride, phosphate or hydroxide.

pH: Discovery Zr-PS columns are stable from pH 1 to 13. For basic compounds, experiment with high pH, and low pH for acidic compounds to maximize their hydrophobicity. At low pH (pH <4) do not add ammonium fluoride to the mobile phase as this can lead to the formation of HF.

