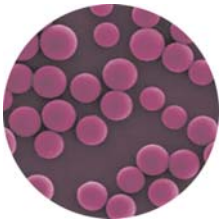
Choosing Packing Materials

Base Materials

Silica-based packings are compatible with a wide range of aqueous and organic solvents. Silica-based column can withstand high pressure. Most silica are stable from pH 2-7.5 but special silica may stable from pH 1-10. Silica provides high resolution or sharp peaks with small molecules. Silica-based column are offen used for separations of low molecular weight analytes.

Polymer-based packings are compatible with most mobile phase solvents and sample with a pH 1-14. Polymer-based packing have lower efficiencies for a small molecules compared to silica-based due to smaller surface area. Polymer-based packings are offen used for ion exchange or ion exclsion chromatography.

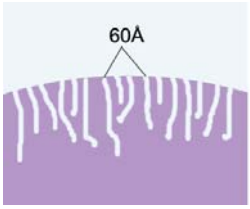
Polymer packing, 10µm



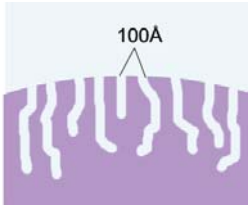
Silica packing, 5µm

Particle Size

Standard particle size is 5 µm. Smaller particle sizes give higher efficiency and higher resolution than larger particle sizes. Larger particle sizes offer faster flow rates and lower back-pressure.



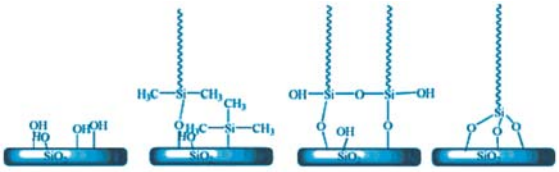
Silica 60Å pore size



Silica 100Å pore size

Pore Size

In general, packing materials with a smaller pore size have higher surface areas and higher capacities than packing materials with larger pore sizes. For general purpose reverse phase application, pore size 100-120Å is recommended. For higher resolution, pore size 60-80Å is recommended. For large molecule such as proteins, pores size 300Å is recommended.



Silica Surface

Monomeric bonding

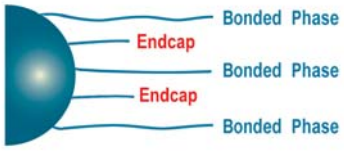
Polymeric bonding

Surface Area

A larger surface offers higher capacity and greater resolution. Smaller surface areas equilibrate faster.

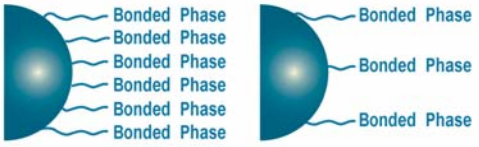
Phase Type

There are 2 types of bonding, polymeric and monomeric. Polymeric bonding offers better column stability under aggressive mobile phase. Monomeric bonding offers lower back pressure. However, high-purity silica phases are very stable whether monomeric or polymeric bonding.



Endcapping

Free silanol in silica-based reversed-phase packings will interact with polar compounds. Endcapping the bonded phase with C2-C4 will minimizes these interactions. However, non-endcapped phases enhance polar selectivity and stronger retention of polar organic compounds.



High Load

Low Load

Carbon Load

Lower carbon loads are more weakly hydrophobic and reduce retention times. Higher carbon load offer higher capacity and greater resolution.