

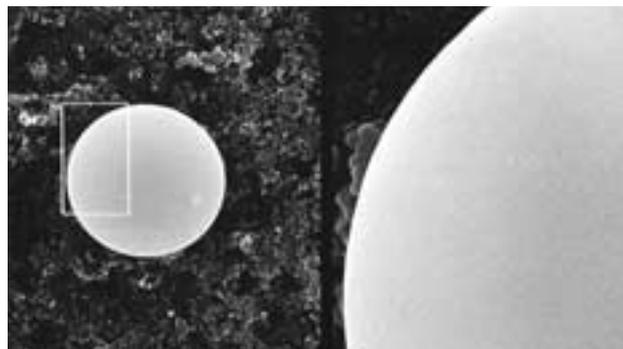
Base Silica-Gel

The physical properties of silica-gel for modern HPLC packings are significant factors which decide the chromatographic properties. Strict control of the physical

parameters are essential, including control of particle shape, silica-gel purity, surface area and pore geometry.

Shape for The Silica-Gel

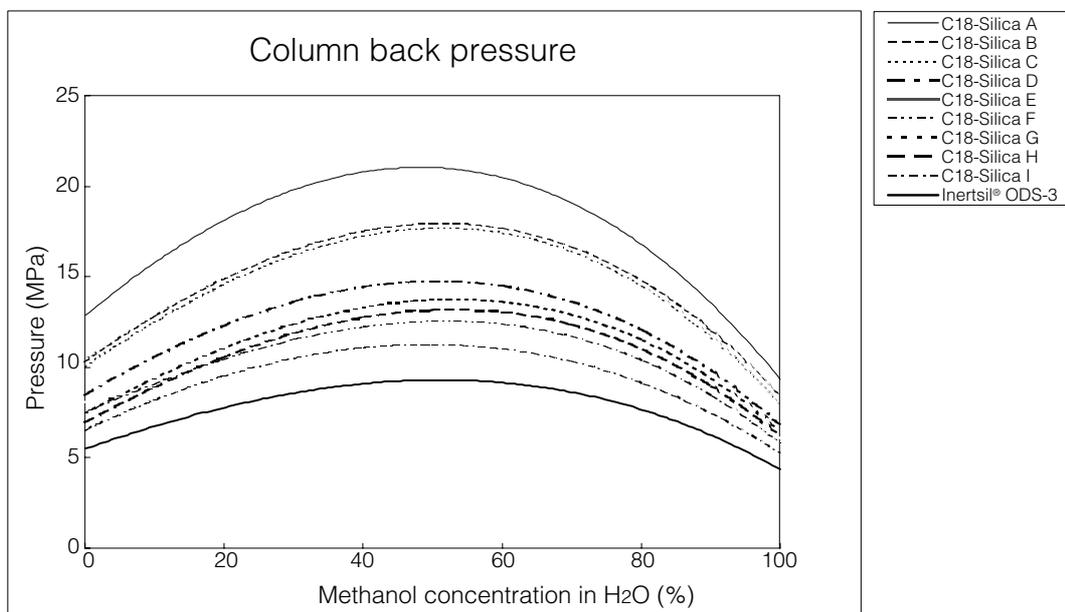
SEM photographs of Inertsil® silica-gels are shown at right. There are many silica-gels on the market which have rough surfaces and cracks. In contrast, Inertsil® silica-gels have a highly smooth surface and spherical shape. To provide durability and high inertness with good reproducibility for a long period of the time, highly spherical and smooth surface silica-gels are ideal for HPLC chromatography. A rigorous test by SEM is employed for base silica-gels used for Inertsil® packings.



Classification of The Silica-Gel

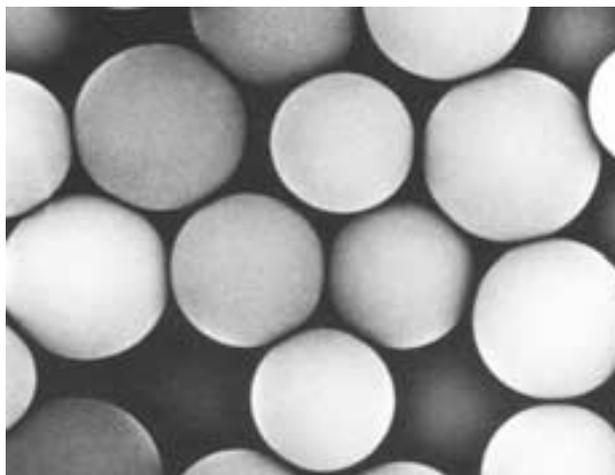
GL sciences has developed advanced classification technologies for sizing silica-gels. A specific narrow sized band of silica-gels can be classified from synthesized silica-gels in a highly reproducible manner. The obtained silica-gels are submitted to Laser Scattering Particle Size Distribution Analysis to inspect the distribution meeting the specification. In this way, batch-to-batch column back pressure deviation is minimized and low operating pressure is ensured. The following figure

shows the column backpressures of Inertsil® ODS-3 and other manufacturer's columns. Inertsil® 3 series generates lower column backpressures, under 100 kgf/cm² (9.8MPa) even when using H₂O/MeOH eluents which generate notoriously high backpressure on standard columns. By providing low operating pressures, Inertsil® helps maximize column lifetimes and minimize instrument maintenance.

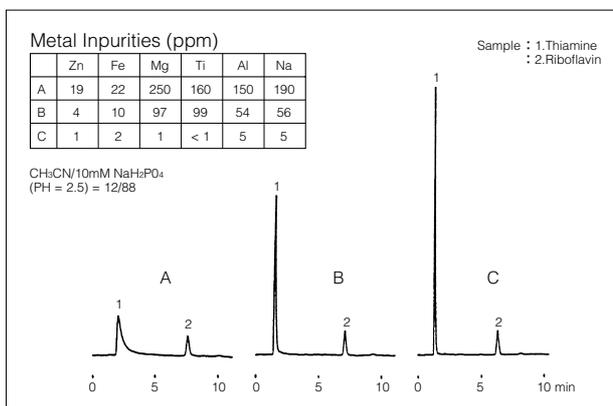


Silica-Gel Purity

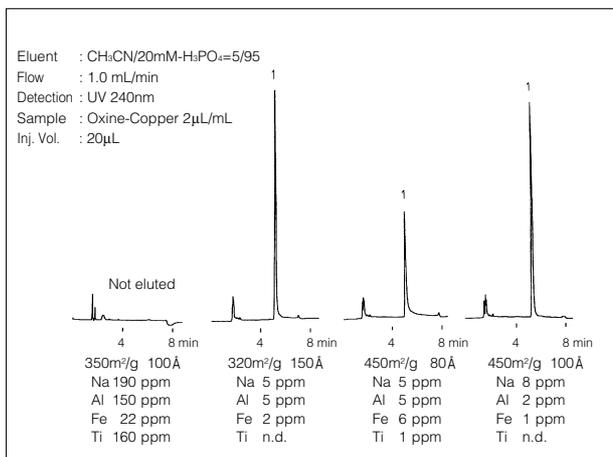
GL Sciences is the first company which emphasized the importance of the silica-gel purity and established a successful manufacturing process for high purity silica-gel. GL Sciences uses only the purest reagents available, from which contaminants are excluded. Metal ions on a silica-gel surface increase the acidity of the surrounding silanols, promoting increased interaction with polar compounds like bases. Our process excludes metal ions from the silica surface.



At right Thiamine, a water soluble vitamin, is analyzed on columns containing different levels of metal contamination. A symmetrical peak of Thiamine can be obtained only on the column packed with high purity silica-gel such as Inertsil®.



A quantitative analysis of chelating compounds which form complex with metal ions on the silica-gel surface is difficult on standard silicas. Oxine copper is one of these compounds, and elutes with a good peak shape from the packing material based on high purity silica-gels.



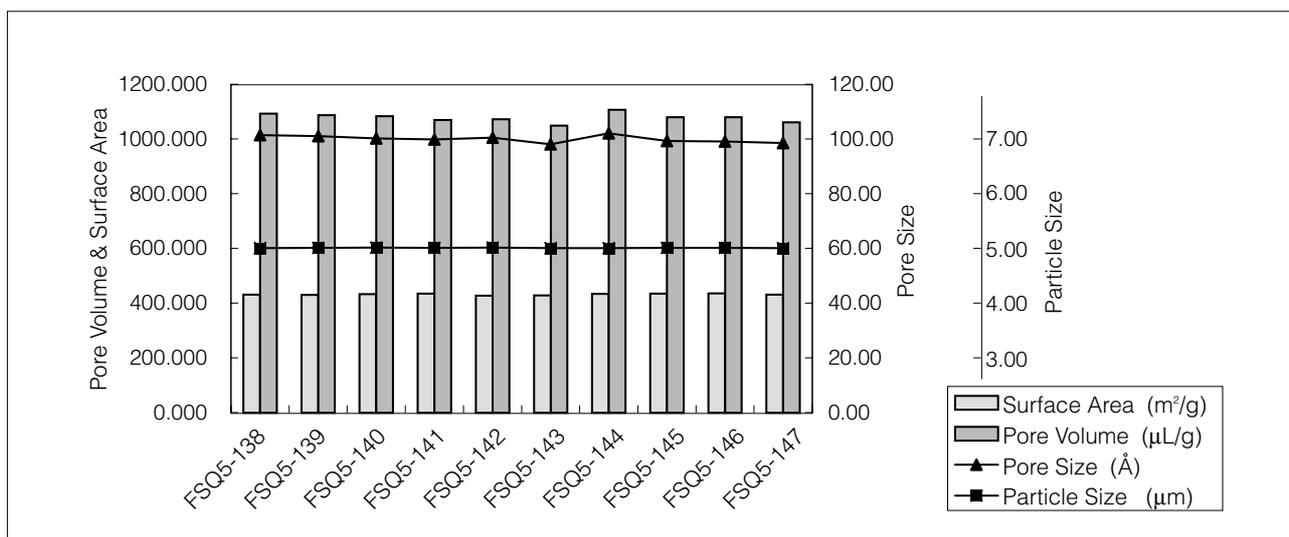
Recently, most samples in the pharmaceutical field require demanding analytical conditions. High purity silica-gels show less non-specific adsorption and are ideal for pharmaceutical analysis. Inertsil® silicas are inspected for metal contamination by Atomic Emission and ICP as indicated at right.

Manufacturer's Validation Certificate		
Inertsil® ODS-3V 5µ Lot. No. VQ5-1142		
Atomic Emission [ppm]	Specification	Results
Fe	< 10	5
Na	< 10	4
Al	< 10	1
Ti	< 1	< 0.5

Particle Size, Surface Area, Pore Size and Pore Volume

The structural elements that form the skeleton of the silica-gel are critically important to the chromatographic results. Generating consistent retentivity and capacity factors on a series of column lots requires consistent bonding of a each ligand to a specified carbon load. The carbon loading is directly related to the specific surface area and pore volume. Therefore the synthetic procedure used to manufacture the silica have to be controlled rigorously in detail. The particle size, surface area, pore size and the pore volume are measured by nitrogen adsorption and the surface area is also measured by

Laser Scattering Particle size Distribution Analyzer. Every batch of synthesized silica-gels are subject to rigorous inspection and only those batches meeting the strict specifications are used for the subsequent bonding procedure. The figure below shows reproducible physical properties on consecutive silica-gel batches. The consistency of the manufacturing process is verified by the fact that virtually no batches fail to meet the specifications set by GL Sciences, even though these specifications are extremely demanding and narrowly defined.



Physical Properties of Inertsil® Packings

In the Inertsil® groups, we have Inertsil® 3 series, 2 series and the other Inertsil® columns. The Inertsil® 3 series is the latest generation of HPLC columns which show improvements in silica purity, silica durability, and

reduced operating pressures. The new Inertsil® 3 series provides new selectivities to create a wide range of separation capabilities.

Packing	Carbon Load	End Capping	Particle Size	Silica Specific Surface Area	Silica Specific Pore Volume	Silica Pore Size	Silica Purity
(Inertsil® 3 Series)							
Inertsil® ODS-3	15.0%	Yes	3,5,8μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® ODS-3V	15.0%	Yes	5μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® ODS-P	29.0%	Non	5μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® C8-3	9.0%	Yes	3,5,8μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® Ph-3	9.5%	Non	3,5,8μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® CN-3	14.0%	Non	5μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® NH2	8.0%	Non	5μm	450m ² /g	1.05mL/g	100A	99.999%
Inertsil® SIL-100A		Non	5μm	450m ² /g	1.05mL/g	100A	99.999%
(Inertsil® 2 Series)							
Inertsil® ODS-2	18.5%	Yes	5μm	320m ² /g	1.15mL/g	150A	99.999%
Inertsil® C8	10.5%	Yes	5μm	320m ² /g	1.15mL/g	150A	99.999%
Inertsil® C4	7.5%	Yes	5μm	320m ² /g	1.15mL/g	150A	99.999%
Inertsil® Ph	10.0%	Yes	5μm	320m ² /g	1.15mL/g	150A	99.999%
Inertsil® SIL-150A		Non	5μm	320m ² /g	1.15mL/g	150A	99.999%
(The other Inertsil® Columns)							
Inertsil® ODS-80A	17.5%	Yes	5μm	450m ² /g	0.70mL/g	80A	99.999%
Inertsil® PREP-ODS	20.0%	Yes	10μm	350m ² /g	0.90mL/g	100A	99.9%
Inertsil® PREP-C8	10.0%	Yes	10μm	350m ² /g	0.90mL/g	100A	99.9%
Inertsil® PREP-SIL			10μm	350m ² /g	0.90mL/g	100A	99.9%
Inertsil® Econo PREP-ODS	17.0%	Yes	40μm	400m ² /g	0.80mL/g	80A	99.999%
Inertsil® Econo PREP-SIL			40μm	400m ² /g	0.80mL/g	80A	99.999%