

# Spherical Silica Gel - HPLC, MPLC, Flash & Gravity LC Phases

## Spherical vs. Granular

### 1. Physical Properties

- Spherical has lower pore-volume and high bulk density  
*Higher loading in the same column volume*
- Spherical has high specific resistance.  
*Low impurity content*
- Spherical has high transparency.  
*Low content of fine particles*

### 2. Particle Size Distribution

- Spherical has lower mean particle size and sharper distribution  
*Higher efficiency*  
*Lower pressure drop and easier flow rate*
- Spherical Shape  
*Stable chromatography bed*  
*No fine generations*

### 3. Chemical Properties / Impurities

- Spherical has lower impurity levels, especially for calcium  
*No undesirable tailing of polar compounds*

### 4. Flash Chromatography Test

- Flash chromatography conditions:

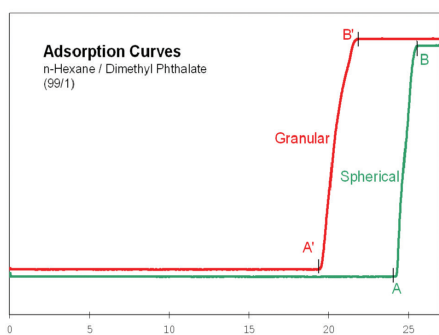
Column:	20 x 500 mm glass column
Sample weight:	25 g
	1. Benzene 2. Dimethyl phthalate
Mobile phase:	<i>n</i> -hexane / ethyl acetate (90-10) w/w
Flow rate:	5 cm/min (15.7 ml/min)
Detection:	UV 254 nm

Spherical Silica shows higher resolution. The reasons are:

- Smaller particle size.
- Homogeneous packing due to the spherical particle shape.

### 5a. Adsorption Curve

- A long break through time (point A) indicates higher capacity
- A short mass transfer time (A-B) indicates higher equilibrium

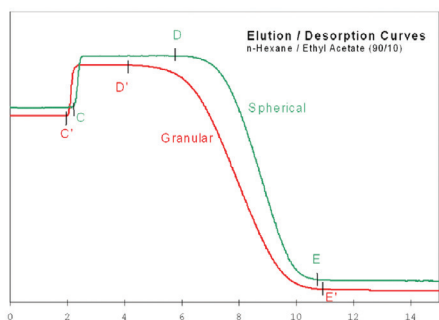


Both silica gels were packed in 4.6 x 250 mm stainless steel columns by dry packing.

Capacity of dimethyl phthalate (DMP):  
Flow rate 2 ml/min  
d (solvent) 0.65 g/ml or 1.3 g/min  
DMP (1%) 13 mg/min  
Capacity (mg) 13 x A

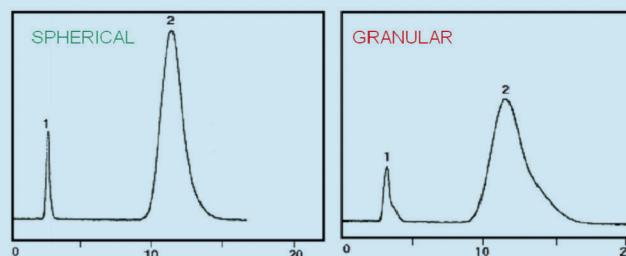
### 5b. Elution / Desorption Curve

- Short mass transfer time (Short equilibrium) (D-E) indicates lower solvent consumption



Spherical Silica Cat. #63700 100 Å, 75-200 µm  
Granular Silica Competitor A 100 Å, 60-200 µm

Items	Unit	Spherical	Granular
Surface area	(m <sup>2</sup> /g)	272	281
Pore volume	(ml/g)	0.81	1.14
Bulk density	(g/ml)	0.51	0.40
Loss on drying	(%)	6.43	1.65
pH (5% suspension)	-	7.8	7.5
Specific resistance	(Ωcm)	57,100	15,700
Transparency	(%)	76	33
Particle Size			
d50 (Average)	µm	103	143
d10	µm	141	228
d90	µm	80	9
d10/d90	-	1.8	2.5
Chemical Impurities			
Na	µg/g	298	530
Ca	µg/g	90	1100
Fe	µg/g	18	60
Column height (mm)		172	235
Retention time (DMP) min		10.61	11.44
k' (DMP)		2.48	3.50
N (DMP)		241	118
Symmetry (DMP)		1.6	2.1



Adsorption Times	Unit	Spherical	Granular
Point A	(min)	24.0	19.3
Point B	(min)	25.3	21.5
Segment A-B	(min)	1.3	2.2
Column Capacity	(mg)	312	251
Silica capacity	(mg/g)	146	155
<b>Elution Times</b>			
Point C	(min)	2.3	1.9
Point D	(min)	5.8	4.1
Point E	(min)	10.5	10.8
Segment C-E	(min)	8.2	8.9
Segment D-E	(min)	4.7	6.7
C-E: Elution time			
D-E: Concentration change time (Mass transfer zone)			

## 6. Conclusion

When using spherical silica gel you will have

- Increased loading - up to 30% more
- Greater reproducibility of process
- Sharper peaks and cost savings (less solvent consumption & labor)
- Longer bed lifetime (decrease cost of labor and silica consumption)
- Better chromatographic results without switching to costly HPLC equipment.
- Increased yield with tighter pore symmetry