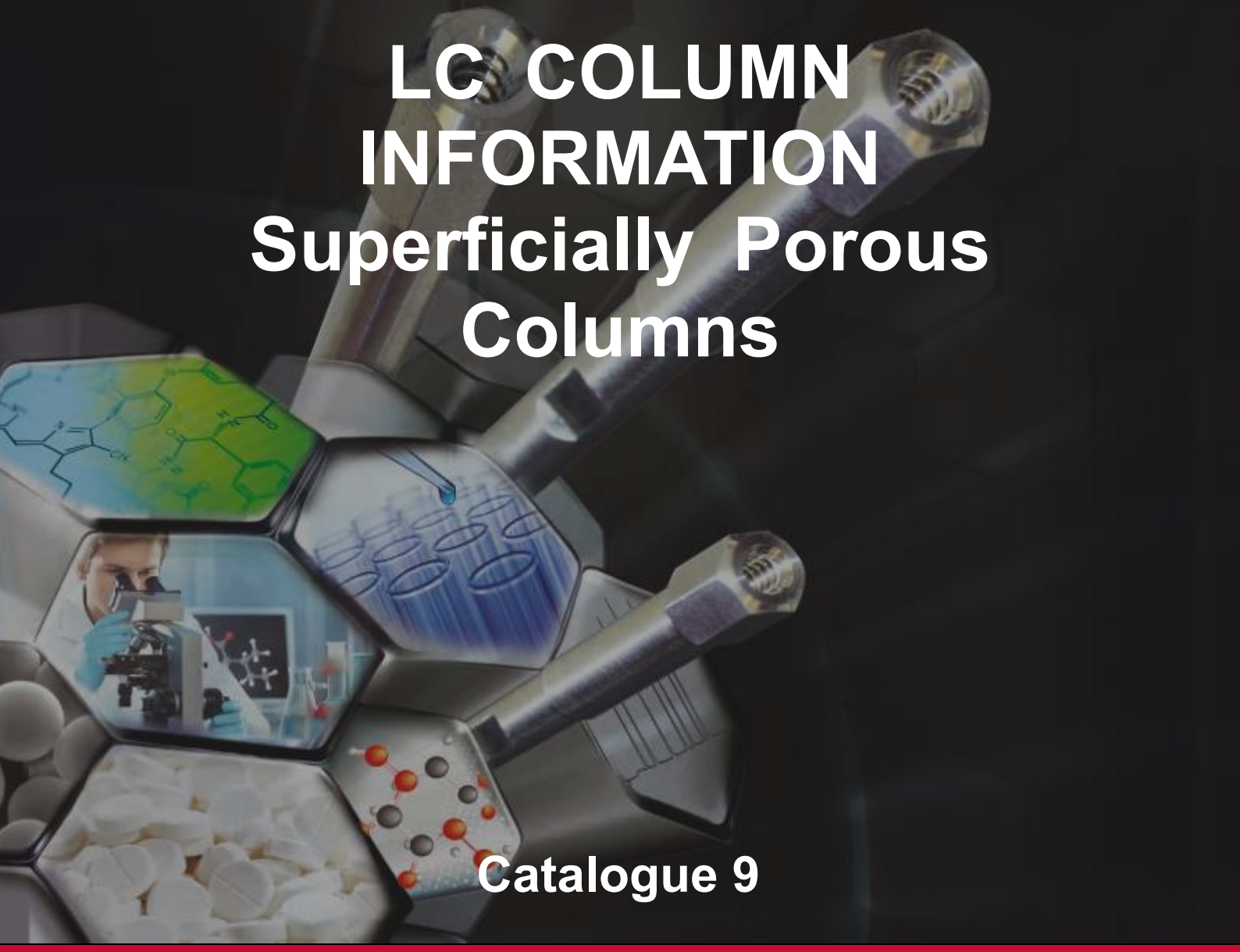
HICHROM

Chromatography Columns and Supplies

LC COLUMN INFORMATION Superficially Porous Columns



Catalogue 9

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SUPERFICIALLY POROUS COLUMNS

Superficially porous particles (also called Fused-Core®, core shell or Core Enhanced Technology™ particles) consist of a solid silica core with a porous silica outer shell. These particles typically have diameters of 2.6 to 5µm. Columns packed with 2.6 or 2.7µm phases typically provide the efficiency and separation speed of sub 2µm UHPLC particles but at considerably lower back pressure. Columns packed with 5µm phases typically show comparable efficiencies to conventional porous 3µm columns.

Benefits of Superficially Porous Phases

High efficiency

Since diffusion only occurs in the porous outer shell and not the solid core, efficiency is increased compared to a totally porous particle of the same size. Resistance to mass transfer (C term in van Deemter equation) in superficially porous particles is reduced due to the limited diffusional path of the analytes (see Figure 1). For fast LC this results in high flow velocity without peak broadening. In addition, the tight control of particle diameter in superficially porous materials leads to highly uniform packed beds with minimised eddy diffusion, which also contributes to high efficiencies.

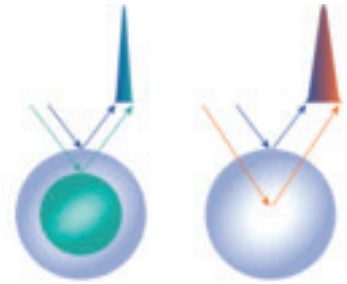

Figure 1. Mass transfer

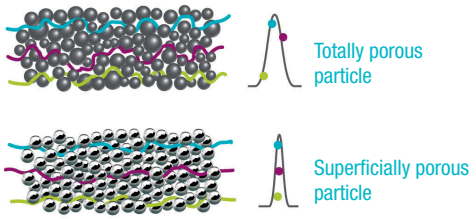

Figure 2. Eddy diffusion

Low back pressure

Superficially porous columns generate significantly lower back pressure compared to other UHPLC columns, facilitating rugged and reliable performance. Operating at these lower pressures avoids frictional heating of the eluent that could have negative effects on column efficiency and unpredictable changes in peak retention and column selectivity. Whereas sub 2µm phases require specialised UHPLC instrumentation to cope with the high pressures generated, superficially porous phases can be used with either UHPLC or conventional HPLC systems.

Robustness

The narrow particle size distribution of superficially porous materials enables the production of more uniformly packed column beds than found in totally porous particles. This leads to robust columns with long lifetimes. In addition, most superficially porous material columns use 2µm porosity column inlet frits, which reduces the inconvenience caused by pressure increases from plugged frits, which can occur with sub 2µm particles.

Columns for biomolecules

Wider pore superficially porous phases (e.g. 150 or 160Å) have been designed specifically to provide an optimum combination of retention and resolution for peptides and small proteins.

Method conversion from fully porous phases

The larger 4 and 5µm superficially porous phases can be used to directly replace conventional methods developed on the same chemistry columns using standard HPLC instruments, without any changes to instrument configuration or method conditions. Higher efficiencies and higher sensitivities can be generated using these 4 and 5µm superficially porous phases. In addition to reproducing established conventional methods, these 4 and 5µm phases enable methods to be modified to include reduced analysis times and hence increased productivity.

Superficially Porous Phases

Brand	Phase	Manufacturer	Particle Size (µm)	Pore Size (Å)	Page
Accucore	RP-MS, C18, aQ, C8, Phenyl-Hexyl, PFP, Phenyl-X, HILIC, Urea-HILIC	Thermo Scientific	2.6	80	223-225, 227
	150-C18, 150-C4, 150-Amide-HILIC, Polar Premium, C30	Thermo Scientific	2.6	150	223, 225-227
Accucore XL	C18, C8	Thermo Scientific	4	80	223, 226, 227
Brownlee SPP	C18, C8, HILIC, PFP, Phenyl-Hexyl, RP-Amide	Perkin Elmer	2.7	90	195
	Peptide ES-C18	Perkin Elmer	2.7	160	195
HALO	C18, C8, HILIC (Silica), RP-Amide, Phenyl-Hexyl, PFP, ES-CN, Penta-HILIC	Advanced Materials Technology	2.7	90	125-129
	Peptide ES-C18	Advanced Materials Technology	2.7	160	125, 127, 129
HALO-5	C18, C8, PFP, Phenyl-Hexyl, ES-CN, HILIC, Penta-HILIC	Advanced Materials Technology	5	90	6, 125, 128, 129
NUCLEOSHELL	RP 18, HILIC, PFP, Phenyl-Hexyl	Macherey-Nagel	2.7	90	6, 162