

Organic SEC (GPC) Columns: Ultra-Rapid Analysis

Features

HK-400

- Newly developed styrene divinylbenzene copolymer monodisperse particles
- Analysis time is reduced to about a sixth of conventional column's analysis time
- Low column pressure even under high flow rate does not require a UHPLC system
- The amount of solvent used is reduced to about a sixth
- HK-402 (exclusion limit: 20,000) and HK-406 (exclusion limit: 10,000,000) newly added to the series
- Fulfills USP-NF L21 requirements

• Ultra-Rapid analysis semi-micro columns

* HK-400 series is recommended to be used with semi-micro type devices.

Product Code	Product Name	Plate Number (TP/column)	Particle Size (μm)	Pore Size (Å)	Column Size (mm) I.D. x Length
F6025010	GPC HK-401	≥ 9,000	3	50	4.6 x 150
F6025020	GPC HK-402 New	≥ 12,000	3	300	4.6 x 150
F6025030	GPC HK-403	≥ 9,000	3.5	550	4.6 x 150
F6026040	GPC HK-404L	≥ 9,000	3.5	2,000	4.6 x 150
F6025050	GPC HK-405	≥ 7,000	3	5,000	4.6 x 150
F6025060	GPC HK-406 New	≥ 5,000	6.5	10,000	4.6 x 150

HK-404L is a mixed-gel column capable of analyzing samples over a wide range of molecular weight distribution.

Base Material: Styrene divinylbenzene copolymer
Shipping Solvent: Tetrahydrofuran (THF)

• Guard filter for HK series

Product Code	Product Name	Contents
F6700200	GPC HK-G	One holder and one filter
F6700100	GPC HK-G filter	3 filters

Removes sample-origin insoluble components.



Attach directly to the analytical column

Usable solvents

Solvent	Product Name	
	HK-401 HK-403 HK-404L HK-405 HK-406	HK-402
Chloroform	○	○
N,N-Dimethylformamide (DMF)	○	○
Toluene	○	○
Hexafluoroisopropanol (HFIP)	○	×
30 % HFIP/Chloroform	○	○

○: Solvent replacement possible ×: Solvent replacement not possible

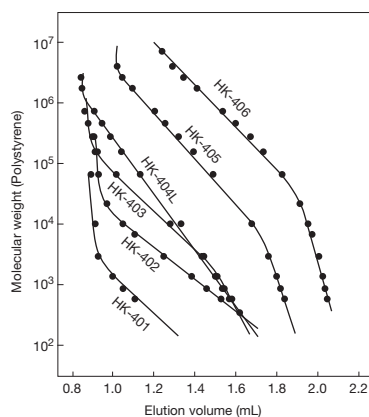
Target molecular weight range and exclusion limit

• Measured with polystyrene (eluent: THF)

Product Name	Target Molecular Weight Range	Exclusion Limit
HK-401	100 - 1,500	2,000
HK-402	200 - 10,000	20,000
HK-403	2,000 - 70,000	100,000
HK-404L	100 - 1,000,000	1,000,000
HK-405	10,000 - 2,500,000	4,000,000
HK-406	30,000 - 8,000,000	10,000,000

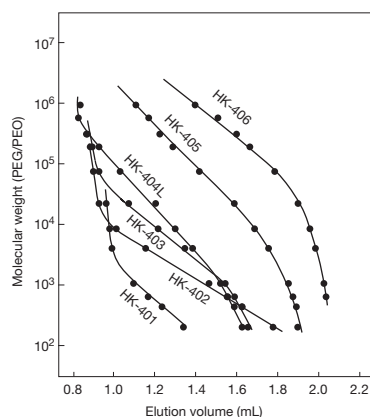
Please use the above table for reference purposes only when selecting columns.

Calibration curves for HK-400 series using polystyrene (eluent : THF)



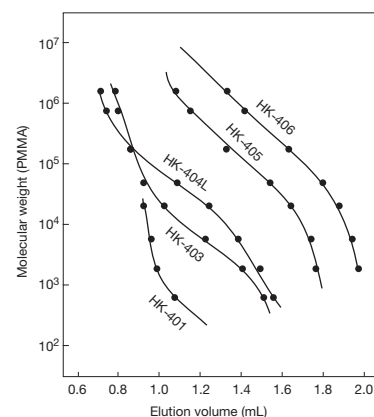
Column : Shodex GPC HK-400 series
 Eluent : THF
 Flow rate : 1.0 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Calibration curves for HK-400 series using PEG/PEO (eluent : DMF)



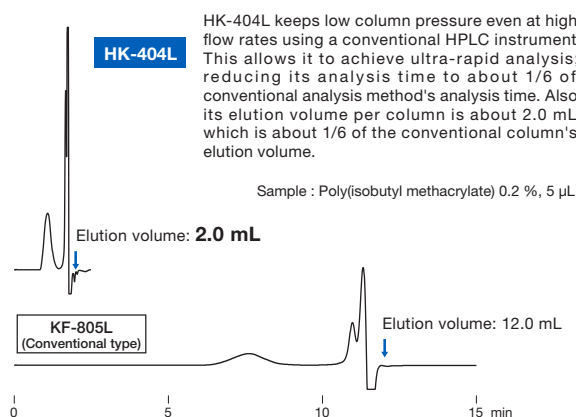
Column : Shodex GPC HK-400 series
 Eluent : DMF
 Flow rate : 1.0 mL/min (HK-402: 0.8 mL/min)
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Calibration curve for HK-400 series using PMMA (eluent : HFIP)



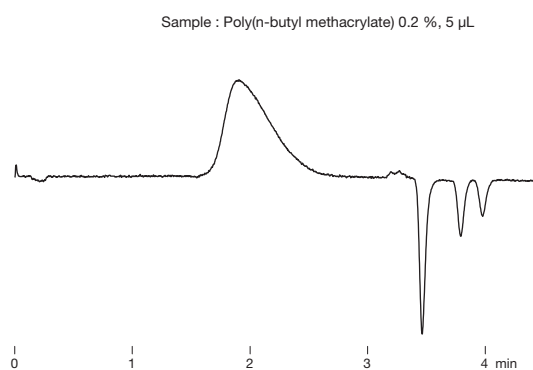
Column : Shodex GPC HK-400 series
 Eluent : 5 mM CF₃COONa in HFIP
 Flow rate : 0.3 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Comparison of HK-404L and conventional column (KF-805L)



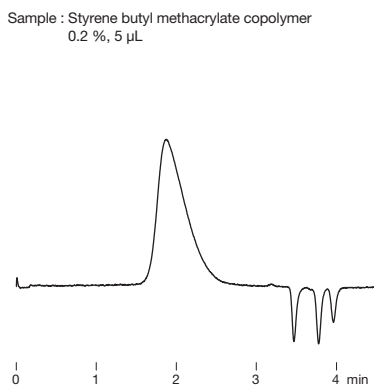
Column : Shodex GPC HK-404L, KF-805L
 Eluent : THF
 Flow rate : 1.0 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Poly (butyl methacrylate)



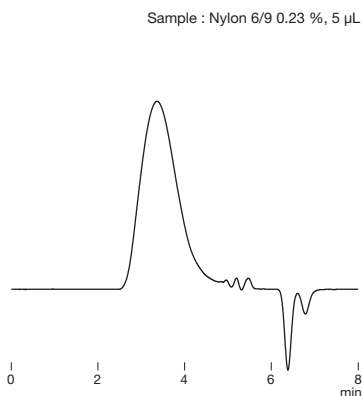
Column : Shodex GPC HK-404L x 2
 Eluent : THF
 Flow rate : 1.0 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Styrene butyl methacrylate copolymer



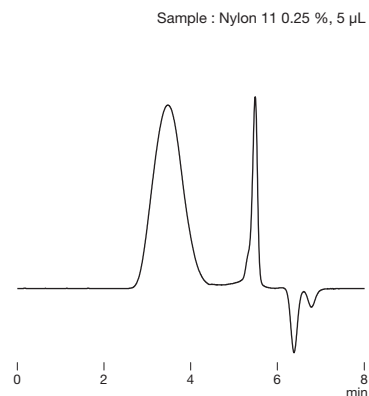
Column : Shodex GPC HK-404L x 2
 Eluent : THF
 Flow rate : 1.0 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Polyamide (Nylon 6/9)



Column : Shodex GPC HK-404L
 Eluent : 5 mM CF₃COONa in HFIP
 Flow rate : 0.3 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Polyamide (Nylon 11)



Column : Shodex GPC HK-404L
 Eluent : 5 mM CF₃COONa in HFIP
 Flow rate : 0.3 mL/min
 Detector : RI (small cell volume)
 Column temp. : 40 °C

Solvent Replacement Applicability of Organic SEC (GPC) Columns

Solvent	Product Name									
	Shipping Solvent : THF							Shipping Solvent : DMF		
	KF-801	KF-802 KF-802.5 KF-803L KF-804L	KF-803	KF-804 KF-805 KF-805L KF-806M KF-806L KF-807L	KF-401HQ KF-402HQ KF-402.5HQ	KF-403HQ	LF-804 LF-604 LF-404	KD-801 KD-802 KD-802.5	KD-803	KD-804 KD-805 KD-806 KD-807 KD-806M
Tetrahydrofuran (THF)	○	○	○	○	○	○	○	×	×	○
Chloroform	○	○	○	○	○	○	○	×	×	○
Carbon tetrachloride	×	○	○	○			○	×	×	○
Benzene	○	○	○	○	○	○		×	○	○
Toluene	○	○	○	○	○	○	○	×	○	○
p-Xylene	×	○	○	○	○	○		×	○	○
o-Dichlorobenzene (ODCB)	×	×	○	○	○	○		×	○	○
1,2,4-Trichlorobenzene (TCB)	×	×	○	○	○	○		×	○	○
Dioxane	×	○	○	○				×	○	○
Diethyl ether	×	×	○	○				×	○	○
Ethyl acetate	×	×	○	○				×	×	○
Acetone	×	×	○	○	○	○		×	○	○
Methyl ethyl ketone	×	×	○	○	○	○	○	×	○	○
N,N-Dimethylformamide (DMF)	×	×	○	○	○*	○*	○*	○	○	○
N,N-Dimethylacetamide (DMAc)	×	×	○	○	○*	○*	○*	×	○	○
Hexafluoroisopropanol (HFIP)	×	×	×	○	×	△*	○*	×	○	○
m-Cresol	×	×	○	○				×	○	○
o-Chlorophenol	×	×	○	○				×	○	○
Quinoline	×	×	○	○				×	○	○
N-Methyl-2-pyrrolidone (NMP)	×	×	○	○	○*	○*	○*	×	○	○
Dimethyl sulfoxide (DMSO)	×	×	×	×	△*	○*	○*	×	×	○
30 % m-Cresol/Chloroform	×	○	○	○			○	×	○	○
30 % o-Chlorophenol/Chloroform	×	○	○	○			○	×	○	○
30 % HFIP/Chloroform	×	○	○	○				×	○	○
Hexane	×	×	×	×	×	×	×	×	×	×
Acetonitrile	×	×	×	×	×	×	×	×	×	×
Methanol	×	×	×	×	×	×	×	×	×	×
Water	×	×	×	×	×	×	×	×	×	×

○ : Solvent replacement possible

△ : Solvent replacement possible, but this may cause column performance to deteriorate slightly

* : Usable at 40 °C or higher

× : Solvent replacement not possible