TSKgel ODS-100Z and TSKgel ODS-100V Column Series Provides a Universal Solution for the Analysis of Samples Containing Acidic, Basic, Polar & Non-polar Compounds

Abstract

Using high purity Type B silica, Tosoh has introduced two new columns with differing surface treatment procedures and carbon content levels to provide unique selectivities for a wide range of sample types.

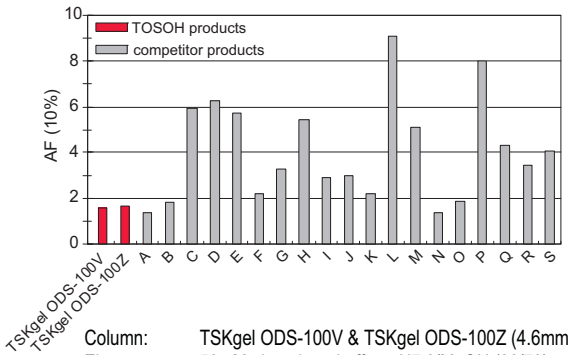
Introduction

In recent years, many new octadecylsilane (ODS) chemistries have been made commercially available that offer optimized properties for select subsets of compound types. The overriding trends in the release of new stationary phases has shifted toward 1) high purity, metal free silica 2) base-deactivated surfaces 3) stronger retention of polar compounds and 4) improved reproducibilities from column to column and silica lot to silica lot. Rarely, have new ODS column types provided a universal solution to the multitude of applications being performed. Further, column selection to match the best column with the application has been difficult.

With the introduction of TSKgel ODS-100V and TSKgel ODS-100Z, excellent chromatography and selectivity can be achieved with a wide range of sample types. Due to the fact that both stationary phases use the same ultra-pure base silica with 5µm particle size and 100Å pores, the same chromatographic properties are achievable for columns of different lots. Different selectivities result by varying the carbon content and surface optimization. *Table 1* summarizes these differences.

TSKgel ODS-100V columns are optimized for polar compounds while the TSKgel ODS-100Z are the better choice for more hydrophobic compounds. Both column types provide symmetrical peak shapes for strongly basic and acidic compounds, demonstrating the absence of accessible residual silanol groups and metal-ion impurities on the silica surface, respectively.

Figure 1. Comparison of peak shapes for basic compounds at pH 7.0



Column:	TSKgel ODS-100V & TSKgel ODS-100Z (4.6mm ID x 15cm)
Eluent:	50mM phosphate buffer, pH7.0/MeOH (30/70)
Flow Rate:	1.0mL/min
Temp:	40°C
Inj. Volume:	10µL
Sample:	Desipramine

Table 1: Properties of TSKgel ODS-100V and TSKgel ODS-100Z

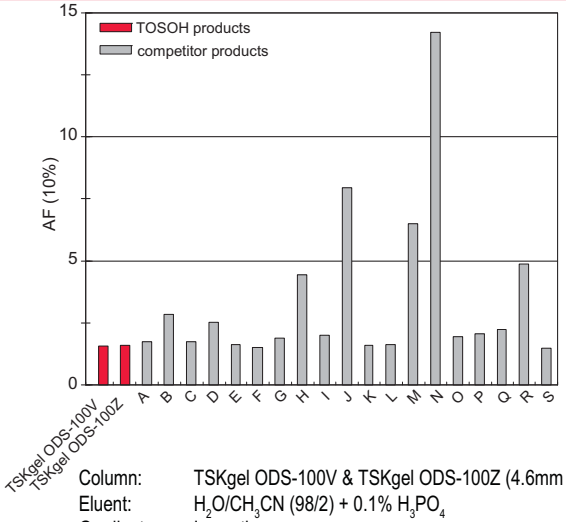
	TSKgel ODS-100V	TSKgel ODS-100Z
Carbon Content	15%	20%
Particle Size (µm)	5	5
Endcapped	yes	yes
Pore size (Å)	100	100
Preferred sample type	Polar	Hydrophobic
Bonded phase structure	Monolayer	Monolayer
Specific surface area (m^2/g)	450	450
*Asymmetry factor (10%)	0.90 - 1.15	0.90 - 1.15
*Theoretical plates	14,000	14,000

* Specifications for 15cm x 4.6mmID columns packed with 5 micron particles. Conditions: 70% methanol-30% water; F=1mL/min; T=40°C; N and AF are based on naphthalene peak. Typical pressure: 6MPa.

Results

Basic and Acidic Compounds:
The tricyclic antidepressant desipramine, containing a secondary amine group, was analyzed at pH 7.0 to illustrate column performance under conditions where accessible residual silanol groups would be negatively charged. It is apparent from *Figure 1* that tailing is minimized on new TSKgel ODS columns relative to other commercially available C18 column brands. Similarly, at pH 2.2, formic acid used as the test probe to judge the chromatographic behavior of charged acidic compounds, reveals good peak shape as indicated in *Figure 2*

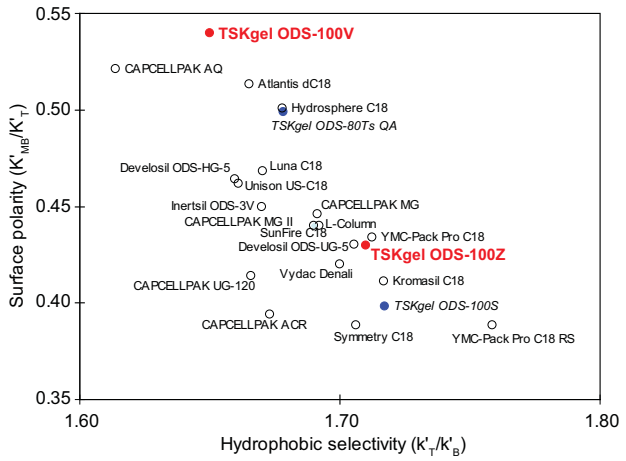
Figure 2. Comparison of peak shapes for acidic compounds at pH 2.2



Column:	TSKgel ODS-100V & TSKgel ODS-100Z (4.6mm ID x 15cm)
Eluent:	H_2O/CH_3CN (98/2) + 0.1% H_3PO_4
Gradient:	Isocratic
Flow Rate:	1.0mL/min
Detection:	UV @ 254nm
Temp:	40°C
Inj. Volume:	10µL
Sample:	Formic acid

Hydrophobic and Polar Compounds:
The hydrophobicity and surface polarity of both stationary phases are represented in *Figure 3.* The TSKgel ODS-100V has more polar properties than most recently released AQ-type phases. Retention of hydrophobic test probes differing in one or more methylene groups, indicated that TSKgel ODS-100Z has more hydrophobic character than TSKgel ODS-100V and is comparable to the majority of commercially available phases. Thus, scientists can use standard mobile phases when testing the performance of the new TSKgel ODS columns in comparison to brands they currently use.

Figure 3. Scatter Plot of Hydrophobic vs. Polar Characteristics



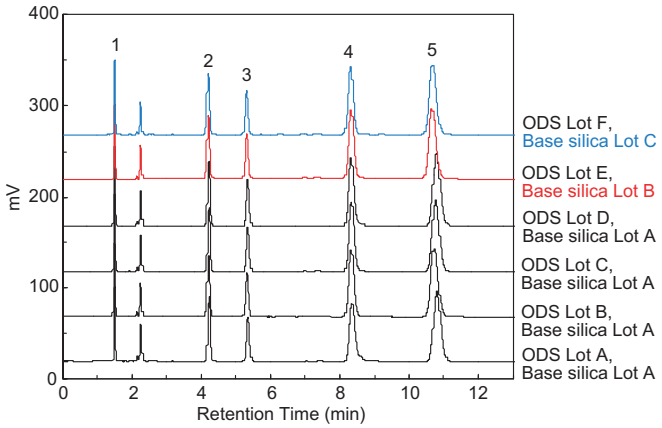
Column:	TSKgel ODS-100V and TSKgel ODS-100Z (4.6mm ID x 15cm)
Eluent:	H_2O/methanol = 30/70
Gradient:	Isocratic
Flow Rate:	1.0mL/min
Detection:	UV @ 254nm
Temp:	40°C
Inj. Volume:	10µL
Sample:	Toluene; Benzene; Methylbenzoate

Reproducibility:
Lot-to-lot reproducibility of the TSKgel ODS-100Z is shown in *Figure 4.* A total of six different stationary phases lots were examined. The six lots included 3 different base silica lots, thus representing columns from different silica and bonding lots, and columns that differ only in the bonding lot. Consistent chromatographic results were obtained regardless of base silica or bonding lot.

Conclusions:

The recently commercialized TSKgel ODS-100V and TSKgel ODS-100Z column set provides a universal solution for most reverse phase separations.

Figure 4. Reproducibility of TSKgel ODS-100Z, as demonstrated with six (6) lots of columns



Column:	TSKgel ODS-100Z, 5µm (4.6mm ID x 15cm)
Eluent:	20mM phosphate buffer (pH 7.0)/methanol = 20/80
Gradient:	Isocratic
Flow Rate:	1.0mL/min
Temp:	40°C
Inj. Volume:	10µL
Sample:	1. Uracil, 2. Methyl benzene, 3. Toluene, 4. Quinizarin, 5. Amitriptyline

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