Novel Perfusion Media of Pulverized Monolithic Silica Enabling High Performance with Low Pressure in Peptide and Protein Separation

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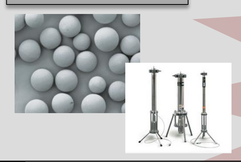
Pulverizing Monolith Into "Dual-Pore Silica Beads"

"Dual-Pore Silica Beads" Leads to "True Perfusion" Flow Dynamics

Our continuous efforts have made through to successfully develop 1 liter + monolith. However, still limited in scale and flexibility left monolith out of main stream in process chromatography.

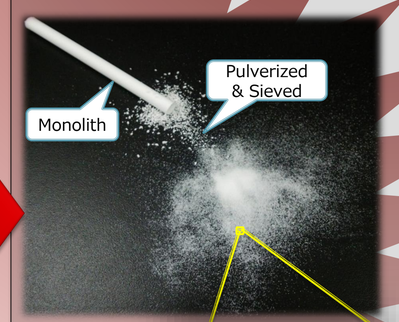
Conventional Single-Pore Silica Column



Large Monolithic Silica Column

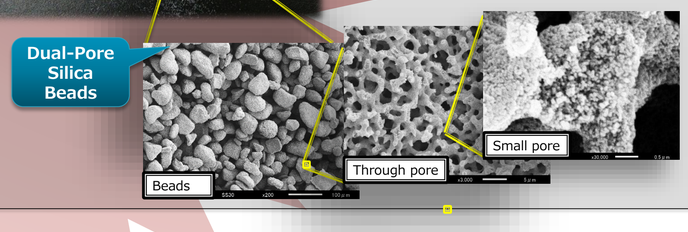
Pros	○ Standard Product	◎ High Performance
	○ Ease of Scale-Up	◎ Low Back-Pressure
Cons	× Limited Performance	△ Still Limited in Scale
	× High Back-Pressure	× Custom Column Needed

Our Next Efforts and Solution are:

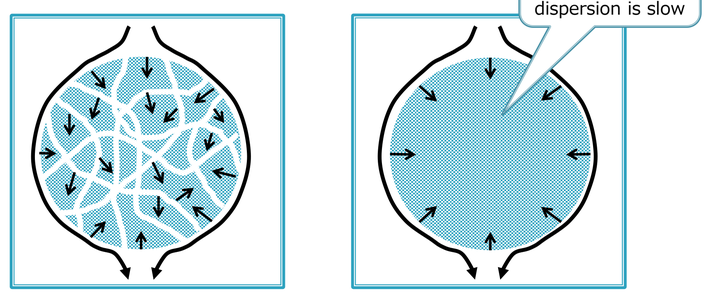


Features

- Enhanced flow dynamics
- Inherited features of monolithic silica
  - *Excellent column performance, high through-put*
  - *Very-low back pressure*
  - *Chemical & mechanical resistance*
- The same usage as conventional silica beads.
  - *No limit in size & No need of special column*



Presence of micrometer scale large through pore provides rapid fluid dispersion into each particle, enabling faster adsorption and desorption.

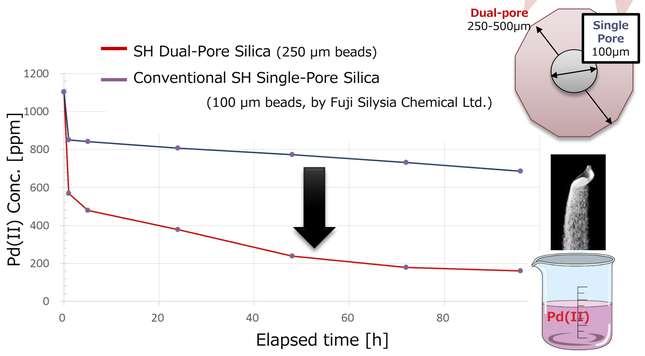


"Dual-Pore Silica" Bimodal Pore

Conventional Silica Single Pore

(Case 1) As Metal Scavenger in a Batch Adsorption

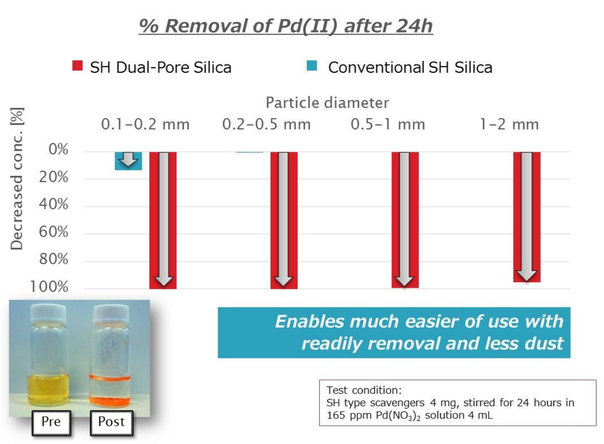
Superior Adsorption of Dual-Pore Silica Even Though Larger in Size



Test condition:
SH (thiol) type scavengers 53mg, stirred in 1000 ppm $Pd(OAc)_2$ in DMSO 50 mL

(Case 1) Much Larger Beads Also Work in a Batch for 24h

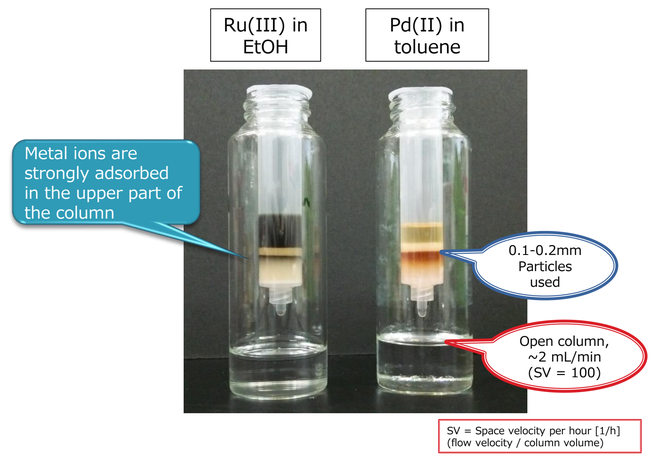
> Φ1mm Dual-Pore Silica is better than Φ100μm Single-Pore



Enables much easier of use with readily removal and less dust

Test condition:
SH type scavengers 4 mg, stirred for 24 hours in 165 ppm $Pd(NO_3)_2$ solution 4 mL

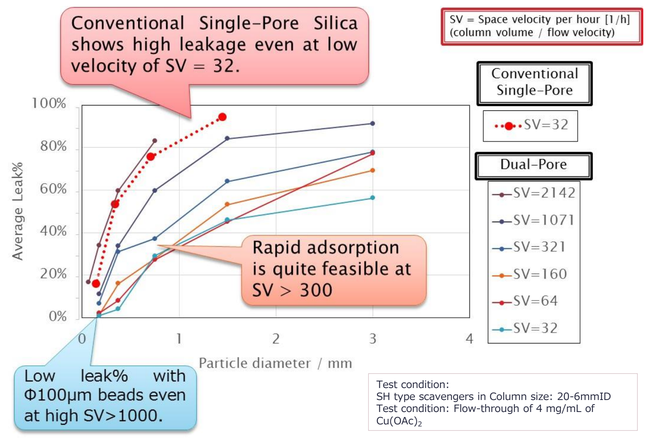
(Case 2) Metal Scavenger in Flow-Through System



SV = Space velocity per hour [1/h] (flow velocity / column volume)

(Case 2) Dual-Pore Unleashed Excellent Dynamic Binding Capacity

even with larger beads



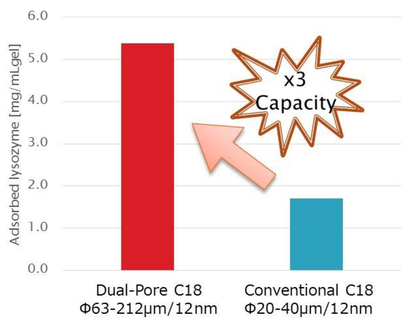
Test condition:
SH type scavengers in Column size: 20-6mmID
Test condition: Flow-through of 4 mg/mL of $Cu(OAc)_2$

(Case 3) Also Showed Superb Binding Capacity for Peptides

Suitable for Pre-Column

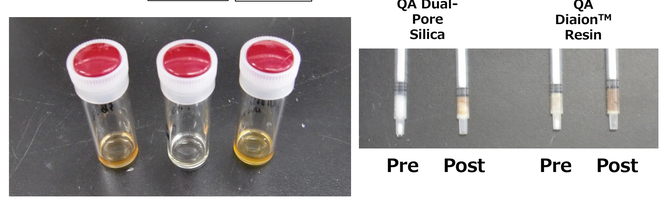
- Large beads used (63-212um)
- x3 Higher adsorption capacity for lysozyme
- With much lower column pressure
  - Natural drop applicable

Test condition:
Gel 0.15mL
2 mg/mL Lysozyme solution 1mL
Flow rate: 0.25 mL/min



(Case 4) Brown Sugar Decolorization by QA*-Functioning Media

The sugar colorants are a complex mixture of various organic compounds ranging from 2k to 2,000kDa

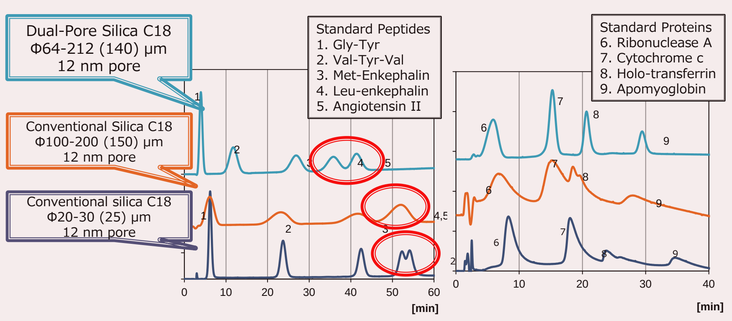


* QA: Quaternary Ammonium
** Polystylenic media by Mitsubishi Chemical Corp.

Test condition:
SH type scavengers in Column size: 20-6mmID
Test condition: Flow-through of 4 mg/mL of $Cu(OAc)_2$

(Case 5) Excellent Separation for Peptides/Proteins

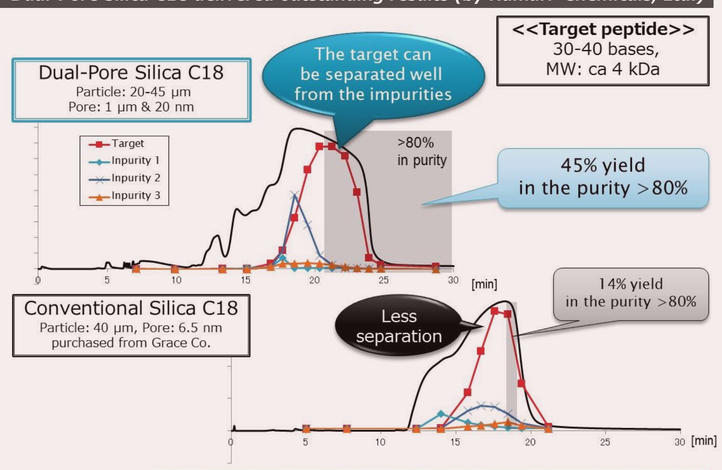
Even Φ140μm Dual-Pore Silica C18 is superior to Φ25μm Single-Pore



Column size: 250-4mmID
Linear gradient of acetonitrile
8.6–26% (0.1% TFA) in 0–60 min

(Case 6) Actual Study to Purify Hard-to-Isolate API of Synthetic Peptides

Dual-Pore Silica C18 delivered outstanding results (by Hamari Chemicals, Ltd.)



Grace C18-WP (Φ : 25 μm, Pore: 25 nm) was also tested: Dual-Pore Silica also showed better separation with lower back pressure.

Column: 250-4mmID
1mL/min of ACN/water(AcOH) in gradient

SUMMARY

- **SnG Inc. has its own Large Monolithic Silica technologies which are already proven as high-end media in analytical HPLC scale, but were limited to this application due to difficulty of its synthesis.**
- **SnG Inc. has also developed pulverized form "Dual-Pore Silica Beads" from the Large Monolithic Silica.**
- **In this presentation, we showed that "Dual-Pore Silica Beads" have superb adsorption and desorption performance which serves as superior adsorbent and chromatography media.**
- **SnG Inc. is seeking for US/EU business as well as academic partners who are willing to co-develop this versatile platform into high-end unique products.**

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