Packing Properties of YMC-Triart Prep

Even after the exposure to 50–100 MPa the YMC-Triart Prep material shows no signs of degradation. Consequently, this stationary phase is the ideal choice for any preparative chromatography application.

- High mechanical stability for frequent repackings
- Lower backpressures due to improved particle size distribution
- Extended lifetimes and higher flow rates possible

Issue of increasing pressures with conventional silica gel

The use of mechanically stable stationary phases is an important economic aspect in a chromatographic process and also a matter of sustainability. **A rigid material can be used longer and repacked more often before it requires replacement.**

The mechanical robustness directly determines the lifetime of the packed column bed. With conventional silica materials, there are particles that are damaged by pressure or shear forces over the course of time that will release fines. These fines do not only clog the column frits, but also the flow channels of the packing materials, resulting in a constant increase in backpressure.

This effect is even more pronounced during the repacking of stationary phases.

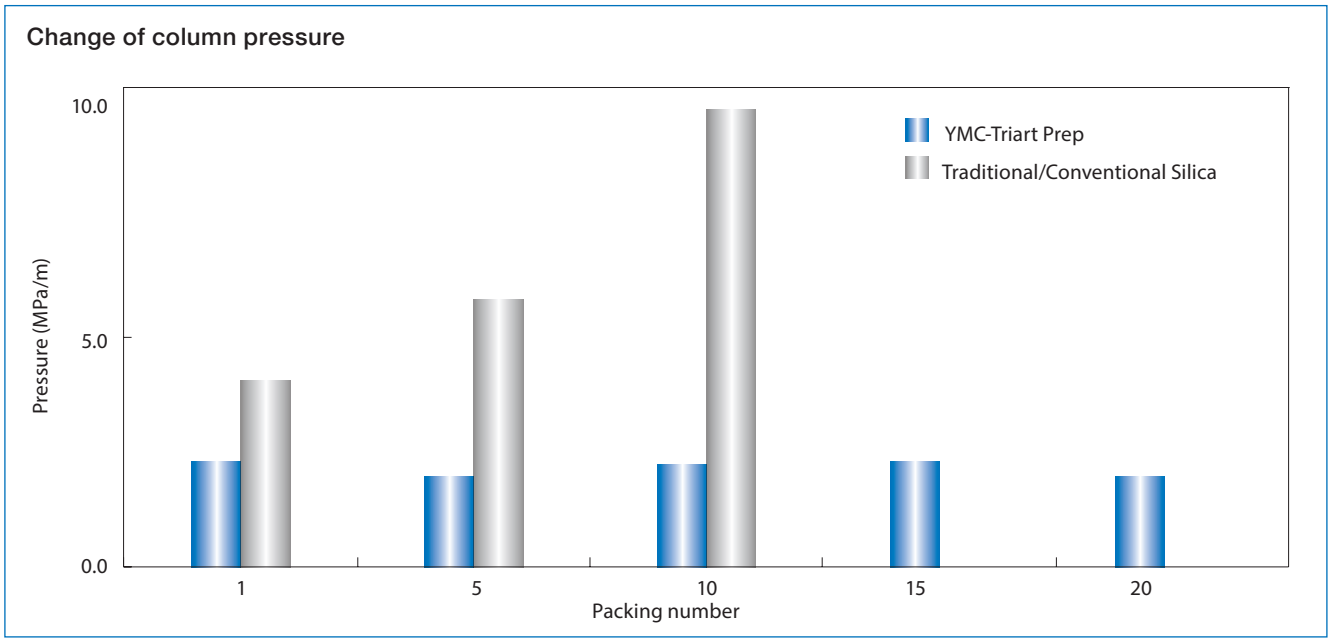


Figure 1: Pressure vs. number of packing cycles for YMC-Triart Prep and conventional silica

YMC-Triart Prep

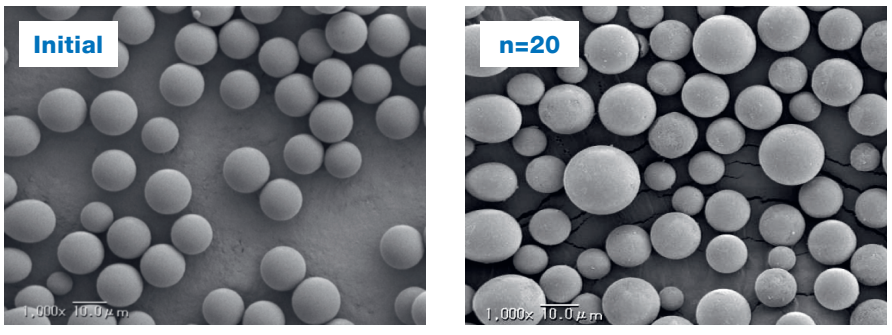


Figure 2:
SEM pictures of the hybrid silica-based YMC-Triart Prep before the first packing and after the 20th packing

In order to demonstrate its high robustness, YMC investigated the packing properties and the mechanical stability of the hybrid silica-based YMC-Triart Prep stationary phase. This investigation includes a packing study with repeated packings of a dynamic axial compression (DAC) column as well as hydraulic column packings using higher packing pressures of up to 100 MPa.

1. Dynamic Axial Compression (DAC) column packing

Pressure testing results

The monitored backpressure for the hybrid silica-based YMC-Triart Prep remains unaffected over the repacking procedure which proves the mechanical stability of the particles. This allows an extended usage, especially in case the material needs to be repacked frequently.

In addition, the backpressure is significantly lower compared to silica-based phases at the same condition. Thereby, higher flow rates and a significantly longer lifetime of the packed column can be achieved.

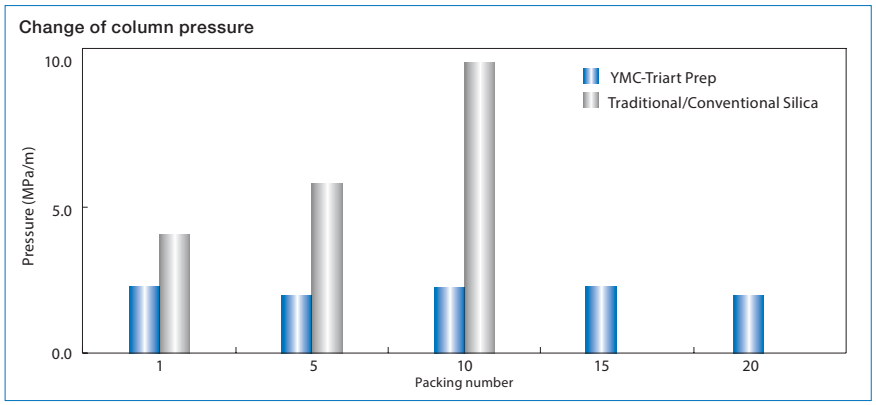
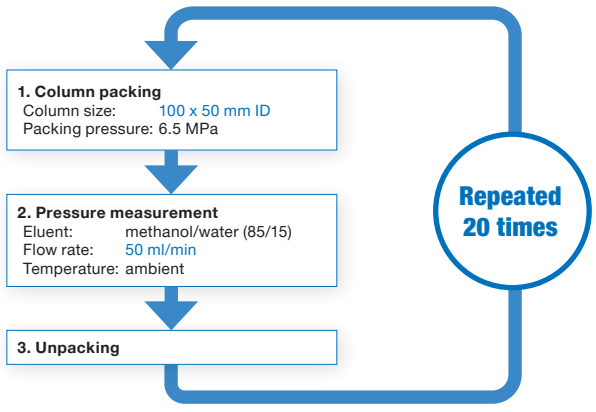


Figure 3: Pressure vs. number of packing cycles for YMC-Triart Prep and conventional silica

Experimental setup

Stationary phase: Hybrid silica-based phase YMC-Triart Prep C8 (10 µm, 20 nm)
Dimension of the packed bed: 100 mm x 50 mm ID
Column type: Dynamic Axial Compression Column DAU-50-700S

Test procedure



The repacking is performed 20 times with the same packing material. After each unpacking, potential fines were not removed so that any possible degradation of particles can be observed. The materials were analysed by SEM.

Dynamic Axial Compression Column
DAU-50-700S

SEM results after DAC packings

By using a Scanning electron microscope (SEM), the defects of the particles after usage can be visualized.

Conventional silica

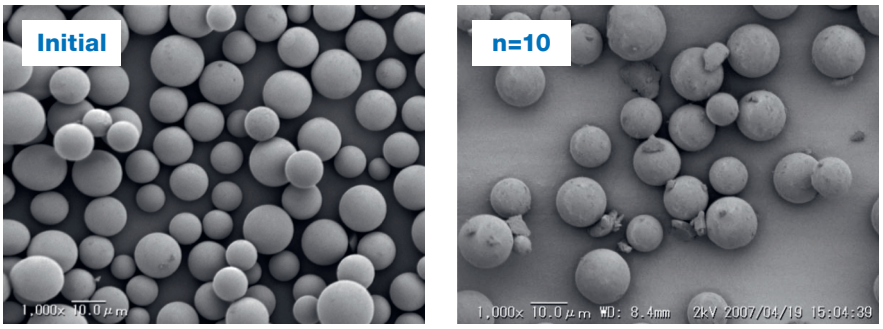


Figure 4:
SEM pictures of the particles of conventional silica material before the first packing and after the 10th packing

For conventional silica, a high number of fragments of collapsed particles can be found. These so-called fines cause a clogging of the frits and the flow channels of the packed column bed. This results in a constant increase in backpressure.

YMC-Triart Prep

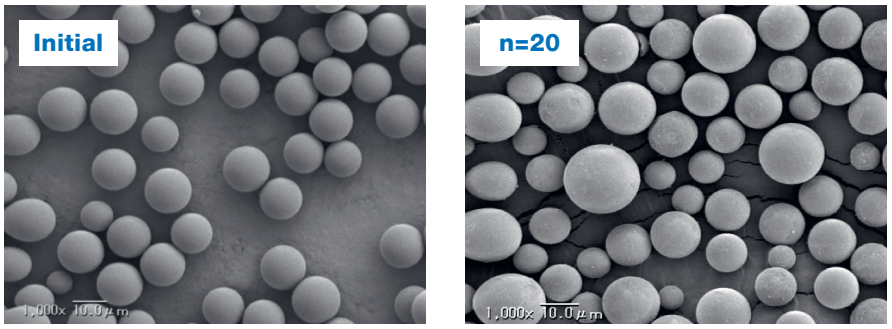


Figure 5:
SEM pictures of the hybrid silica-based YMC-Triart Prep before the first packing and after the 20th packing

The particle shape of the YMC-Triart Prep material is highly regular. Fines are absent also after 20 packing cycles. The improved particle size distribution allows an evenly packed column bed resulting in better separation characteristics and lower backpressures.

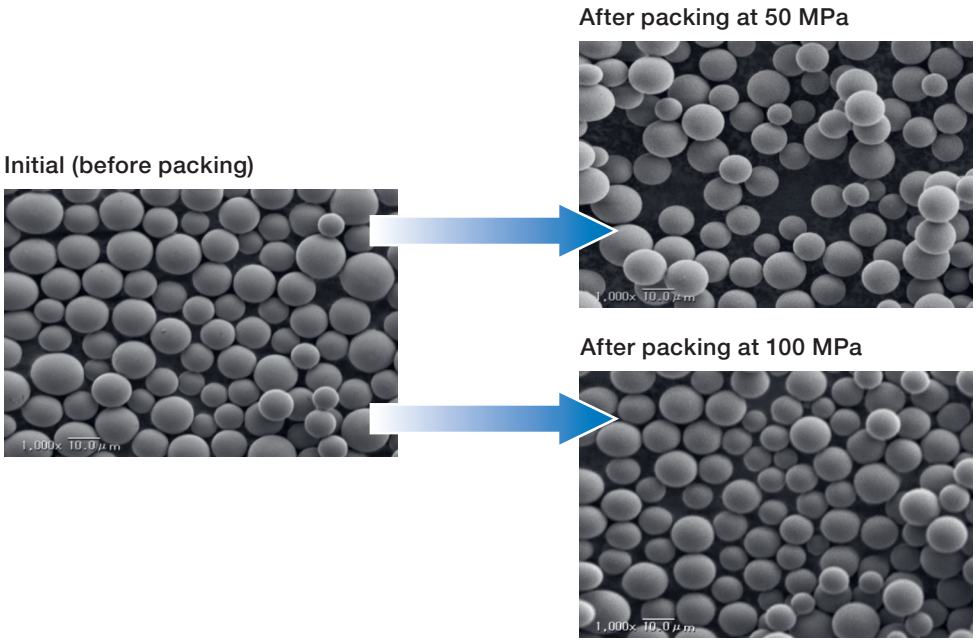
2. Hydraulic Column Packing

For the packing of DAC columns, the applicable packing pressures are typically limited to 7 MPa or 10 MPa because of the DAC column hardware. For the packing of columns with inner diameters of up to 50 mm, also higher packing pressures can be applied. Therefore, the preparative stationary phases need to be stable at higher pressures (up to 100 MPa) as well.

Experimental set-up hydraulic column packing

Stationary phase: Hybrid silica-based phase YMC-Triart Prep C18 (10 µm, 12 nm)
Slurry preparation and transfer: Homogeneous slurry and transfer into a 250 mm x 4.6 mm ID column
Modular column: 250 mm x 4.6 mm ID
Packing pressure: 50 MPa and 100 MPa

SEM Results after Hydraulic Compression



3. Conclusions

Even after the exposure to 50–100 MPa the YMC-Triart Prep material shows no signs of degradation. Consequently, this stationary phase is the ideal choice for any preparative chromatography application.

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