

## Handling of Fractogel® EMD and Eshmuno® Chromatographic Media

The Fractogel® EMD and Eshmuno® product lines comprise several media designed for process scale chromatographic isolations. Fractogel® EMD resins are based on synthetic beads of cross-linked methacrylate polymer resulting in a semi-rigid gel matrix whereas Eshmuno® resins consist of a rigid hydrophilic polyvinylether base bead polymer. Both Fractogel® EMD and Eshmuno® media provide excellent pressure stability resulting in high operating flow rates.

As for all other chromatographic media, appropriate handling is a prerequisite to ensure long lasting use of Fractogel® EMD and Eshmuno® in chromatographic separations with consistent performance. With regard to the pressure flow behaviour care must be taken to avoid damage to resin particles and creation of fines (very small resin particles, resulting from abrasion).

From experience, incorrect procedures during slurry preparation and handling of resin slurry in the course of column packing bear the highest risk to cause damage to resin particles.

The correct procedures for resin handling during preparation, column packing, and unpacking are given below. Should fines have been created by incorrect resin treatment, removal of these fines (for example by decanting) will restore full resin performance. Before decanting allow the resuspended resin to stand until the settled volume doesn't change any more. Settling time depends on resin type, height of the vessel used for settling, slurry concentration, and concentration of the settling buffer.



## Basic rules for slurry preparation and handling

Procedure	Recommended	Strict Don'ts
slurry preparation (suspending the resin)	<ul style="list-style-type: none"> <li>agitation of the supernatant/resin slurry above the settled resin by use of a plastic paddle or rod, or stirrer or</li> <li>shaking of bottled resin by hand or use of a flat bed shaker or roller shaker</li> </ul>	<ul style="list-style-type: none"> <li>permanent/intensive agitation within the settled resin</li> <li>use of magnetic stirrers (the bar will crush the beads)</li> </ul>
pumping slurry	<ul style="list-style-type: none"> <li>membrane pumps</li> </ul>	<ul style="list-style-type: none"> <li>gear pumps</li> <li>piston pumps</li> </ul>
	- peristaltic pumps *	
resuspending resin	<ul style="list-style-type: none"> <li>agitation of the supernatant/resin slurry above the settled resin by use of a plastic paddle or rod, or stirrer or</li> <li>shaking of bottled resin by hand or use of a flat bed shaker or roller shaker</li> <li>stirrers should have an impeller (a) or propeller (b) geometry:</li> </ul> <div style="text-align: center;"> <p>a                      b</p> </div> <p style="text-align: center;">tip speed of the stirrer should not exceed 2.5 m/s</p>	<ul style="list-style-type: none"> <li>permanent/intensive agitation within the settled resin</li> <li>use of magnetic stirring bar</li> </ul>
storage of resin slurry	<ul style="list-style-type: none"> <li>above zero degrees, max 40°C</li> </ul>	<ul style="list-style-type: none"> <li>freezing resin suspension</li> </ul>

\* When using peristaltic pumps employ lowest possible discharge pressure (such that the suspension is just transported). Use only if unavoidable.

### Slurry preparation (resuspend bottled resin)

Resuspending of bottled resin can be accomplished by shaking the container manually or by use of a horizontal flat bed shaker or roller shaker.

Opening the container and using a rod allows for inspection of the degree of resuspending. Fully resuspended resin must not show any clumps/clots or sediments on the bottom of the container.

Do not agitate within the settled resin as this may cause abrasion and damage the resin beads and may result in the creation of fines.



### **Use of slurry tanks / stirring units**

Packing/Unpacking of large-scale columns usually requires separate tanks for slurry preparation and storage. If equipped with a stirring unit, the agitator must be operated gently in the supernatant above the settled resin and must not directly contact the settled resin.

Re-settling of the resin can be prevented by use of a sparger, gentle agitation, or the use of a circulating pump (see part "Pumping of resin slurry").

### **Pumping of resin slurry / using pack-in-place technology**

Large-scale pumping systems/skids are indispensable for transferring the resin slurry into and out of the column. In numerous applications Fractogel® media, reflecting the long presence of these resins on the market, have proven their mechanical stability with the use of various commercial packing/pumping skids and pack-in-place valve technologies (Pall, Millipore, Bio-Rad, GE Healthcare, Eastern Rivers). Passage of resin slurry through small orifices (valves, pack-in-place nozzles) at high flow, however, may cause mechanical/shear stress. Therefore it is advisable to minimise the number of passages/cycles of the resin slurry within a pack-in-place system and keep the resin slurry concentration low.

Gear pumps or piston pumps must not be used as these will destroy the resin particles and create fines. When using peristaltic pumps employ lowest possible discharge pressure (such that the suspension is just transported).

### **Manual unpacking of columns**

If not equipped with a pack-in-place technology the column has to be unpacked manually. With the upper adapter/piston lifted or dismantled buffer is filled into the column. By agitating with a rod or paddle (made of plastic as metal tools may be prone to rusting especially with high salt buffer) within the supernatant above the sediment the resin cake is resuspended.

To make manual unpacking of large-scale columns (>30 cm ID) easier it is advisable to lift the packed resin cake from the bottom plate of the column by pumping buffer in upflow direction.

Penetrating the resin cake with a rod will help to brake the compact cake and allow for easier resuspending.

For lab and pilot scale (~20 cm diameter maximum) one may consider to push the packed bed out of the column under flow with the bottom plate removed.

### **Washing/Handling on a filter frit**

Equilibration and washing of small amounts of resin can easily be accomplished by using glass filters with a sintered frit. Drawing off the liquid from the resin by application of vacuum does not cause damage to the resin. Handling portions of wet resin cake with help of a spatula or small shovel is feasible at small scale. Although this might cause mechanical stress the creation of fines is negligible.

### **Storage of resin slurry**

Store above 4°C, strictly avoid freezing as this may cause damage to the resin particles. Store the resin in 20 % ethanol, containing 150 mM sodium chloride.



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