# Column contamination – what is happening, and how it can be avoided

One of the most common causes of short column lifetime is column contamination, often resulting in high back pressure and a so called “plugged” inlet frit.

This technical tip aims to explain what is happening, and also how column contamination can be avoided.

In the manufacture of particulate based HPLC and UHPLC columns, frits are used to prevent extraneous material entering the column, and to prevent the HPLC packing material from leaving the column. These frits are discs of porous metal, generally 0.5, 1.0 or 2.0 µm in porosity. If samples contain undissolved material, it will be filtered out of the mobile phase solvent stream, sitting on the outside of the inlet frit. As this process continues, the amount of the frit available for mobile phase to pass through becomes smaller, restricting the flow of mobile phase which in turn increases the back pressure. Eventually it becomes impossible to push solvent through the frit and the HPLC pump shuts down.

This process can be averted by the filtration of samples prior to injection onto the HPLC system. It is generally advised to use 0.45 µm porosity syringe filters for samples that will be run on 5 µm columns, 0.2 µm filters for 3 µm columns and smaller. Care should be taken as ideally the sample diluent should match the mobile phase. If it does not, you may find that some sample components are soluble in the sample diluent allowing them to pass through the syringe filter. When they are injected into the mobile phase they may precipitate causing frit blockage. This can be avoided by either dissolving the sample in mobile phase, or alternatively installing an inlet frit, or a guard cartridge as a sacrificial device to prevent the inlet of the column becoming fouled.

Alternatively, we have this web tool which will guide you through guard cartridge selection.