

## How to handle separation columns properly



One of the many high-performance columns from Metrohm: the IC cation column Metrosep C3 – 250 with excellent separating performance guarantees low detection limits.

The separation column is the heart of the ion chromatography setup. Observing a few basic rules when handling columns reduces the risk of damaging them. Particular care is necessary when changing the column, which is normally required in the following situations:

- Changing to a different method for separating identically charged analytes
- Changing from anion to cation determination and vice versa
- Taking an ion chromatograph temporarily out of use
- Replacing the column

The chemical and mechanical stresses to which a high-performance column is subjected are described below.

### Mechanical stress

Among the unavoidable mechanical stresses are pressure shocks, which are normally caused by operating the injection valve.

On the other hand, stress caused by improper column handling can be avoided. If the column is exposed to high acceleration forces, there is acute danger: if the column is dropped onto a hard surface from only a few centimeters or if it knocks against another object, it can be irrevocably destroyed. The irreversible compression of the packing material (separating phase) is responsible for this; it then has cavities or cracks.

Metrohm recommends placing the removed column temporarily on a soft support; for long-term storage it should be put back into the original packaging. These simple measures can considerably extend the working life of the column.

### Chemical stress

Although, according to their specifications, many separating phases tolerate pH values from 0 ... 14, this does not mean that they are chemically inert. In general, columns achieve their longest working life when they are subjected to constant chemical conditions.

Changing conditions also result when the packing material dries out. This causes osmotic pressures inside the packing particles that can be enormous and hence destructive. Bluntly speaking, columns must not be left to dry out.

### Tips for the proper removal of the column

From the points mentioned above, the following tips can be derived for correctly changing the column:

- A column that is not to be used for a longer period (i.e. no eluent will flow through it for a long time) should be removed from the ion chromatograph.
- Before it is taken out of use, the column must be conditioned. The conditions recommended for this are given on the leaflet accompanying the column. Deposits formed from sample constituents or the eluent can become a problem even at low concentrations, because during storage they can react with the separating phase for a long time. Even when contaminants are distributed throughout the whole separating phase by diffusion and are only adsorbed, conditioning will take a long time when the column is used again.
- In order to avoid additional pressure shocks, the column must not be removed immediately after a measurement. Wait until the system is no longer under pressure.
- In order to prevent the packing material from drying out, the removed column should be sealed with the original caps.



Please treat your IC column well! It is the heart of your ion chromatography setup.

- If a column oven is used, the column jacket and packing will expand slightly. This is why columns «dislike» rapid temperature changes. In order to prevent the column from being destroyed before the exchange itself, it should be brought to the room or storage temperature at a rate of less than 5 °C/min. These recommendations also apply for achieving the measuring temperature after starting to use the column again.

### **Proper column installation**

If the whole system is rinsed with the new eluent before the new column is installed, you will save yourself a lot of trouble. In particular, the system from the aspiration filter up to and including the connection capillary – to which the column will later be connected – should be thoroughly rinsed. The minimum volume of eluent required is obtained by multiplying the dead time by the flow rate of a previous measurement. Depending on the degree of contamination, you should use 10 to 50 times the minimum volume of eluent for rinsing. This also ensures that air bubbles are no longer present in the system.

The same procedure should also be carried out when changing to another eluent.

When, after the rinsing procedure, the column oven has reached room temperature and the flow and pressure displays of the ion chromatograph are again showing 0 mL/min and 0 MPa, you can start to install the column in the system.

During operation, precolumns effectively protect the expensive separation column from contamination. The use of a precolumn is always to be recommended; for some applications it is obligatory. A contaminated precolumn no longer provides 100% protection and should be replaced. When a new column is installed, the precolumn must also be replaced. Metrohm offers a wide range of precolumns; they are listed under [www.metrohm.com](http://www.metrohm.com) and in the columns catalog.

### **Can I make measurements immediately after column installation?**

If the new column has been stored below room temperature, it must be allowed to achieve room temperature before use.

If special running-in parameters are mentioned in the documentation of the new column, these must be adhered to. If no information is available, the system can be gently run in as described below.

The eluent used must be the same one as was used for rinsing. The flow rate is adjusted to the standard flow rate in small steps. Before the next higher flow rate is set, the displayed pressure drop across the system should be constant.

Columns have a limited thermal conductivity and require a certain time for the packing material to achieve the temperature set on the column thermostat. If this has not been achieved, the maximum permitted pressure can be exceeded with the standard flow. For this reason, temperature and flow rate should be increased step by step (heating rate approx. 5 °C/min). You should always wait between steps until the values are constant.

If you observe all the points mentioned above and apply common sense, you will achieve excellent separating performances with stationary phases that have been in use for a considerable time.

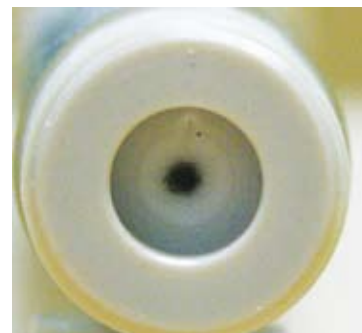
### **Even if you are under pressure, you should answer the following questions before installing a column:**

Has the ion chromatograph been thoroughly cleaned?

Are the capillaries free from gas bubbles or must I expect problems because they remain in the column?

What are the starting parameters for the running-in phase? Is the flow rate not too high? Is the column oven really at room temperature?

Does the column to be installed have to be conditioned with standard eluent before use?



The injection of strongly contaminated samples will result in deposits on the column head and affect the separating performance.



The use of precolumns such as the Metrosep C3 Guard protects the separation column from contaminants and contributes to its longer working life and excellent results.