Technical Note

Everything You Need to Know About Column Care for Gas Chromatography

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What are the most common reasons for column performance degradation/ damage?

Common causes of column performance degradation include physical damage, thermal damage, oxidation, chemical damage (by samples) and contamination.

Sample preparation to extend column lifespan

Considering your sample preparation technique is important for extending the lifetime of your gas chromatography (GC) column. Using highly selective sample preparation techniques is imperative for prolonging the life of your chromatography column. SPE and QuEChERS are suitable selective sample preparation methods. By using such methods, it is possible to remove most impurities and interferences thus extending the lifetime of your column.

Solvent use to extend column lifespan

Some solvents like THF and acetonitrile can be damaging to GC columns, therefore it is important to take this into consider this when designing your sample preparation method. Solvents which can be harmful to the stationary phase of capillary columns should be avoided where possible.

Preventing thermal damage

Before using your gas chromatography column, it is important to understand the column specifications. Your column manual will tell you the maximum temperature the column can operate at safely. Your column will come with a temperature limit range with two maximum temperatures i.e. 280 °C (300 °C). The first temperature is the isothermal maximum temperature which is the limit you can safely run your column at for an extended time whereas the second higher temperature is the programmed temperature limit. The programmed temperature limit is the maximum temperature your column can run at for no more than 10 minutes.

How to store your gas chromatography column

For short term storage your column may be kept inside the instrument, for best practice this should be with carrier gas flow on. However, for longer term storage the column can be disconnected from the instrument and the ends capped (septa is suitable for capping ends). This is important because if the column is exposed to oxygen and/or moisture it can degrade. It is also important to store columns in their box as the degradation of the stationary phase is UV-catalysed.

Column contamination

The best way to avoid column contamination is to ensure that the sample preparation technique is highly selective for the analyte and removes any unwanted contaminants within the sample matrix. Ensure your instrument has a regular maintenance schedule where liners, septa and wash vials are replaced.

Column regeneration

A column can begin to show peak shape deterioration after continued use. In the event of this, it is possible to trim the column to recover column performance.

To regenerate your column, it may be necessary to recondition it. The reconditioning temperature should be in the range of 10 ˚C above your maximum method temperature to the maximum isothermal temperature of the column, which is specified by the manufacturer. Conditioning times can be from several hours to overnight depending on the column.

Cutting the column

Gas chromatography columns should be cut using a column cutter. Score through the polyimide coating and then carefully snap the column. The cut should be straight with no jagged edges. See our GC Column Installation Quick Guide poster for guidance.

Replacing a GC column

Oxidation or oxygen damage can occur in the column due to leaks and contaminated carrier gas. Oxidation will increase with temperature and causes irreversible damage to the stationary phase of the column.

When installing and conducting column maintenance this will cause the column to become shorter over time. Depending on your method temperature and how often you recondition the column at elevated temperatures, this will cause degradation of the stationary phase. These factors will cause change in retention times of analytes and may mean your column can become unsuitable for your application.

Conditioning a new column

Follow the manufacturer guidelines for your column. Generally once the column is installed, condition the column for 1 hour at 10 °C to 20 °C above your maximum method temperature but do not exceed maximum isothermal temperature set out by the manufacture.