KORY'S GC TECK–TIPS

When should I replace my column?

We often get questions on how long certain products should last. This includes concerns about chromatography columns. The problem is that there is not a defined lifetime in months or injections because a column's lifetime is dependent on the way that the column is used, not on any predefined time limits. We have had customers that have successfully used columns for years for clean volatile samples. We have also talked wit customers with very high boiling compounds that don't elute up to 20% of the injected sample and are happy to get more than 20 injections per column. The difference between these two scenarios is the types of samples that are injected on each column.

So, the question of column lifetime is a question that would be best answered by using empirical means. I do not mean to defer the topic, but each customer would know their methods and the requirements of those methods best.

Some analytical methods will allow for more variation than others. A loss in peak resolution of 30% might be acceptable for compounds that have resolution of >3, but not on two problem compounds that have resolution of 1.4 under the best circumstances. I would use the following questions as a guide to developing performance limits that are specific to the method instead of a pre-defined lifetime. These empirical requirements will account for differences in samples, numbers of injections, and numerous other variables.

1. Is there a problem resolution between two peaks in the analysis? If so, a good cutoff would be where the peaks are no longer able to be separated or quantitated. In some fields (like EPA), the valley between two peaks must be less than ¼ of the sum of the two peak heights (the valley must be below halfway between two equally high peaks). Otherwise, a specific resolution number might be easier or more appropriate.
2. Are there active compounds? If there are, setting a degradation limit would be a good factor. EPA does not allow below 20% degradation for active compounds.
3. For high temperature analyses, loss of phase might be a concern. Therefore, a relative difference in retention time might be good to include in addition to the above recommendations.
4. Efficiency might be a good measure of lifetime, but would have effects on peak shape, degradation, and resolution as stated in the above suggestions.
5. If there is sufficient separation, no activity, and no high temperature analyses, then the only way that a method could fail is from poor quantitation. Running a continuing check standard in the lower portion of the calibration range will let you know if calibration is being affected. If the calculated concentration is off by >15 %, it would be good to re-run the calibration curve. If the calibration curve cannot hold linearity, then the efficiency of the column may have been damaged enough that replacement might be necessary.

Key words: Column lifetime, performance, method requirements

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