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## Troubleshooting GC Column Baseline Issues

5 Jan 2021

 By Alan Sensue



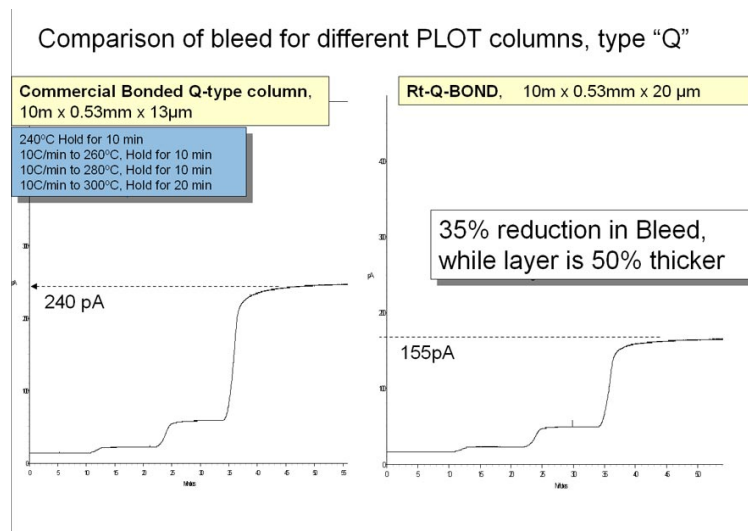
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or it contains additional peaks/spikes, or becomes erratic and drifts up and down. In order to fix the baseline issues you will need to determine the cause. I hope that the information contained in this post, and within the links it contains, will help you troubleshoot and remedy your GC baseline issues.

### **High Bleed**



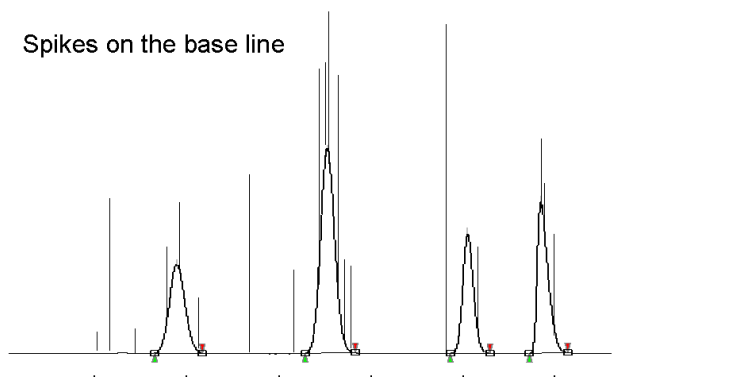
#### **Symptoms:**

1. Abnormally elevated baseline compared to previously obtained/expected baseline for the same (or equivalent) GC column for the same instrument and detector.
2. Baseline keeps rising at high temperatures even when only injecting safe GC solvents like acetone and hexane.
3. Occurred after injecting one or more samples/standards that exceeded the recommended safe pH range of 5 to 9.
4. Occurred after injecting derivatized samples/standards, especially if the derivatization reagent was not completely removed prior to injection.
5. Occurred after overnight conditioning/bake-out.
6. Are you using a low-bleed column?

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1. GC columns are a consumable and do not last forever. Install a different GC column; one you know has low bleed, to confirm the instrument is not the issue.
2. Leak check using an electronic leak detector. Even the smallest leak can damage a GC column's liquid stationary phase in minutes at high temperatures.
3. Never inject strong acids or bases.
4. Never inject derivatization reagents directly into any GC column unless you are certain that damage will not occur.
5. Only condition a GC column until a stable baseline is achieved. Longer conditioning may reduce column life. Make sure to use high quality gas/ filters for the carrier gas. Removal of oxygen and moisture is necessary for the longest column life.
6. Not all GC columns are considered low-bleed. For example, porous polymer PLOT columns have much higher bleed than low-polarity liquid phase columns. For GC columns which are not considered low-bleed, use them only for the analysis they were designed for and at the lowest GC oven temperatures which your analysis will allow.

### **Extra Peaks or Spikes**



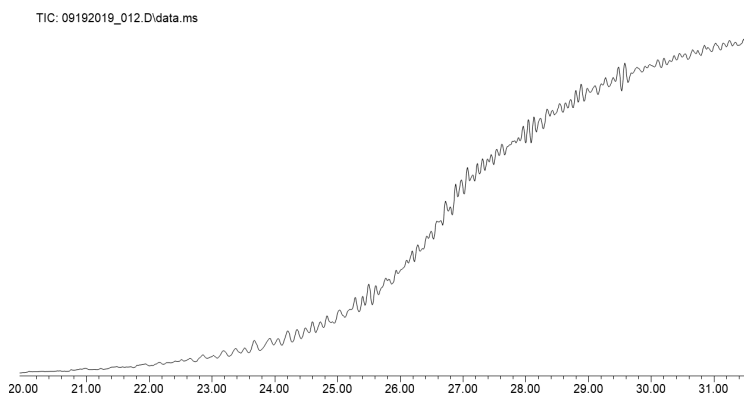
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1. There are peaks in the chromatogram that were not previously there, and should not be there.
2. There are noise spikes in the baseline. Spikes are commonly observed rising from or dipping below the baseline. They are often too narrow to be a compound peak.

#### Solutions:

1. The liquid stationary phase in most GC columns do not typically produce distinct peaks. These "ghost" peaks are commonly caused by contamination. However, the liquid stationary phase may produce jagged peaks (see section below) in certain high-polarity and non-bonded columns.
2. In many cases, spikes are electronic noise from the detector caused by a poor connection or corrosion of electronically energized parts. Particulate matter passing through the detector may also cause spikes.

### **Wavy/Fluctuating Baseline and Jagged/Noisy Baseline**



#### Symptoms:

1. Baseline which is not flat or consistent, even at isothermal temperatures.
2. Baseline which has multiple rises and dips in a

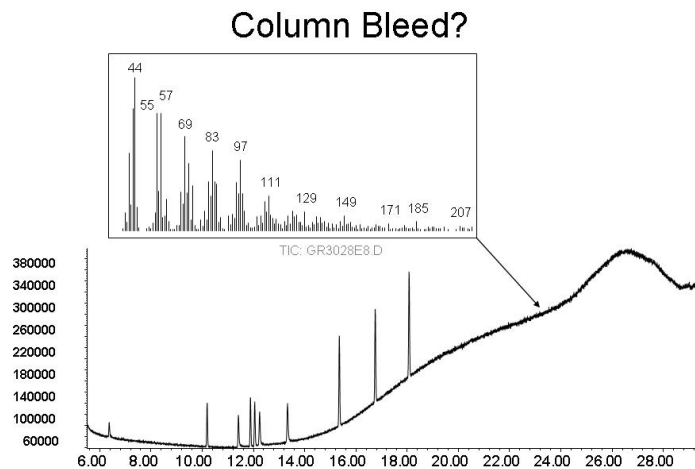
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fluctuating baseline.

Solutions:

1. May be caused by poor quality gases, including but not limited to carrier gas, fuel gas and/or make-up gas. Could be caused by temperature fluctuations. Unstable detector.
2. A jagged baseline can be caused by ramping a GC oven column too quickly, especially high-polarity and non-bonded columns. Limit both the GC oven column heating and cooling cycles to a maximum of 20°C/min.

### **Elevated (High) Baseline**



Symptoms:

1. A rise or fall in the baseline that is not related to an increase or decrease in the GC oven temperature.
2. Occurs when analyzing "dirty" samples.
3. Becomes worse when the injection volume is increases.

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1. Set the GC oven to an isothermal temperature and without injecting anything, monitor the baseline. If it remains elevated for long periods of time, that is likely the baseline for this column at this point in its life. Refer to section on High Bleed.
2. Elevated (high) baseline may be caused by contamination (matrix) and not just the degradation of the liquid stationary phase. Additional sample clean-up may be needed.
3. Baseline may be caused by injection solvent or other vapors remaining in the injection port. Check for injection port leaks and possible plugging/contamination issues with the split vent line and filter.

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