



Determining the Method Detection Limit (MDL) for the Ohio Lumex RA-915+/RP-M324 Sorbent Trap Mercury Analyzer

Method 30-B requires that the MDL of the analytical instrument be determined and in general it is good to know the lowest amount that can be measured with an instrument with a good degree of probability that the small amount measured is not just baseline noise. As a rule of thumb, the MDL is considered to be that amount of an analyte that creates a response (such as a peak) that is about 3 times higher than the average variance in response of a blank baseline. A commonly used method to determine an instrument's official MDL is that found in the EPA's SW-846 protocols. Using this method, 8 replicates of a pretty low standard are analyzed and the MDL is defined as the standard deviation of the responses of the 8 measurements times 3.0. The significance of the "3.0" is that it is a factor for the statistical technique known as the "Student's T Distribution" which is used to determine an MDL with a 95% confidence level that you are actually seeing the analyte you are measuring (mercury) and not just baseline noise. If the number of replicates changes or if you want a confidence level other than 95%, you would use a factor other than "3.0". It's important to use a standard level for your replicates with a response not too much higher than what will be the MDL to get a good determination. Here are steps to perform an MDL determination on the Ohio Lumex Sorbent Trap Mercury Analyzer.

- Put the instrument in its most sensitive mode (profile # 1) with the carrier flow at the lowest level that it will commonly be used in (usually 1 or 2 L/min) and the furnace in its most aggressive mode (usually 680° C).
- Calibrate the instrument as you would in typical use to make sure it's measuring with accuracy and precision (run 5 or 6 points typically from 5 ng to 1,000 ng) also run a blank and a 2nd source standard.
- Using zero-mercury carbon, make and analyze 8 standards at a 3 ng level.
- For these standards it is important that the mercury peak is isolated from baseline noise during integration. This can be accomplished by either waiting to start integration about 30 seconds after the standard is inserted into the furnace and then promptly ending integration after the mercury has all been released, or by manually integrating the peaks.
- For these 8 replicates, calculate the average response in ng of mercury and the standard deviation in the responses in ng of mercury.
- The MDL is defined as 3 times this standard deviation.

As an example: If the 8 replicates of a 3 ng standard produced responses of 2.79, 3.04, 2.89, 3.00, 2.67, 2.85, 3.04, and 3.17 ng of mercury; the average response would be 2.93 ng, the standard deviation would be 0.161 ng and the MDL would be 3 times 0.161 ng = 0.484 ng.