Determination of Methane Concentration

Methane will be measured on the gas chromatogram using a FID (flame ionization) detector.

Note, unless you want smelly hands, it is recommended that you where gloves. A lab coat is recommended for similar reasons.

- Using a 20 ml syringe connected to a 2-way stopcock, collect a little more than 5 ml of water from each port on your Winogradsky column.
- With the syringe pointing up, remove any air (tapping the sides of the syringe) and expel any extra water so that the final liquid volume in the syringe is 5 ml. Do this over a sink for each syringe, and don't squirt yourself or others.
- Now, draw in 15 ml of air into the syringe so that the total air+water volume in the syringe is 20 ml. Close the stopcock.
- Shake the syringe to equilibrate the methane between the air and water for ~60 sec.
- With the syringe pointing down, eject all the water from the syringe into the sink and close the stopcock. Try to get all the water out, but leave at least 10 mL of gas in the syringe. Repeat the above steps for each syringe.
- We will now move to the GC lab in Starr 332 to measure methane.

Calculations

To assist in plotting up results, ***measure the distance from the top of the sediment-water interface to each of the ports on the Winogradsky column***, with distance to the ports in the sediment as positive and those in the water column negative. Also, measure the distance from the sediment-water interface to the surface of the water and the bottom of the sediments.

Methane concentration calculation

- From the standards, determine the concentration of methane in ppmv.
- Use the ideal gas law to determine the number of moles of methane in the 15 ml gas volume:

$$n = \frac{PV}{RT} = \frac{\frac{ppm}{10^6}\frac{15}{1000}}{(0.08205)(293)}$$

- Determine the μM methane concentration in the original water sample, whose volume was 5 ml.
- Note, we are assuming that all methane in the water sample partitions into the gas phase. Since methane's solubility in water is quite low, this is a good assumption; however, we could readily calculate and account for the methane left in the water if were interested in higher precision in our results. We are also assuming laboratory air contains minimal methane (compared to our samples), a good assumption unless there is a gas leak.