GC-SCD at WBRC

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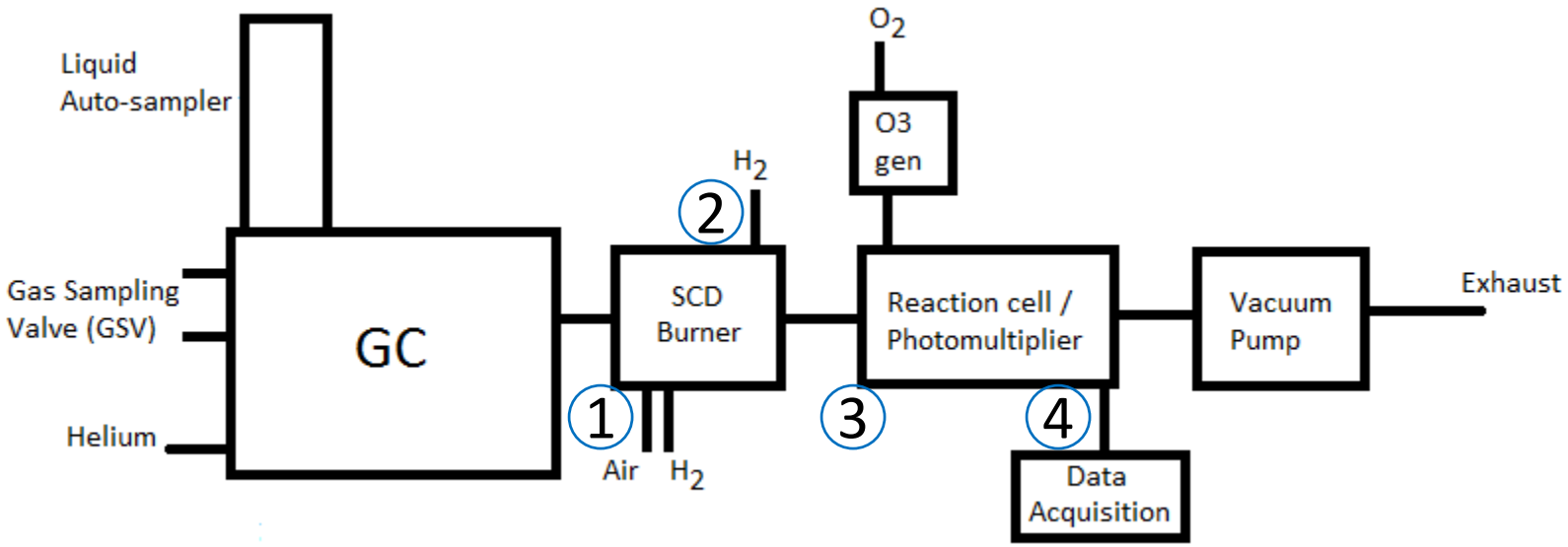
GC-SCD – Working Principle



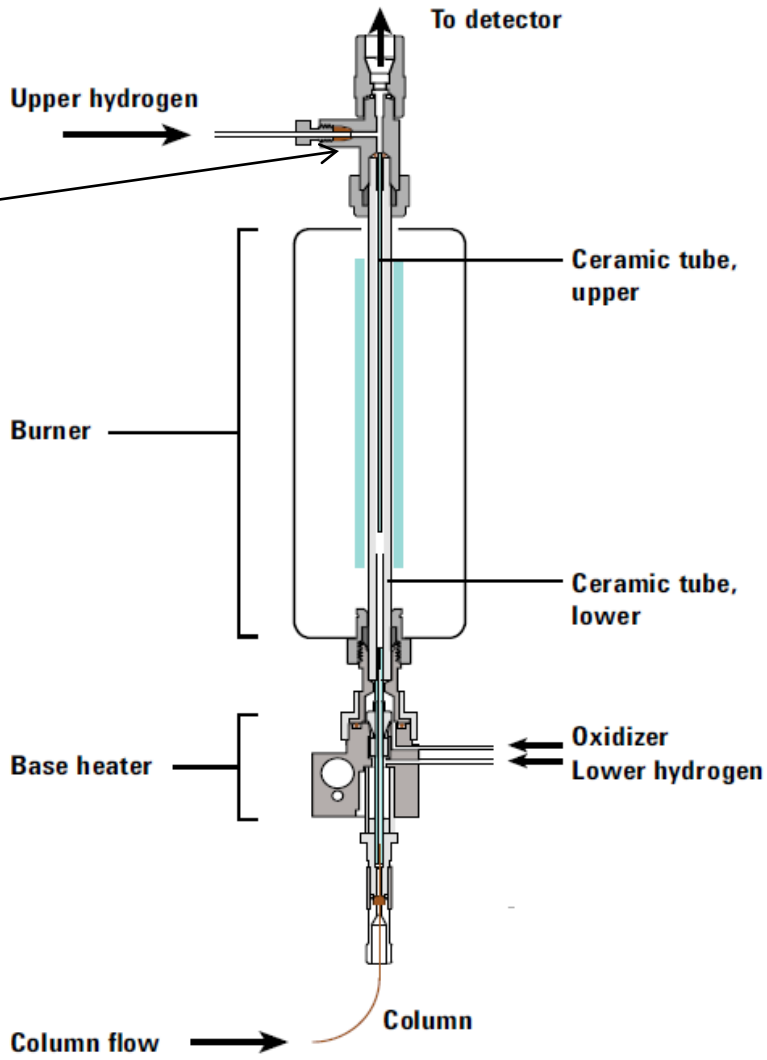
1) Lower burner: combustion to produce SO_2
2) Catalytic tube + upper burner: converts SO_2 to SO
3) Reaction Cell converts: $SO + O_3 \rightarrow SO_2^* + O_2$
4) As high energy SO_2^* return to ground state through chemilumenscence, photomultiplier produces electricity proportional to emitted light.

SCD Burner – Open Questions

Instrument works very well (down to several ppb), but how does SO_2 get converted to SO? Here?

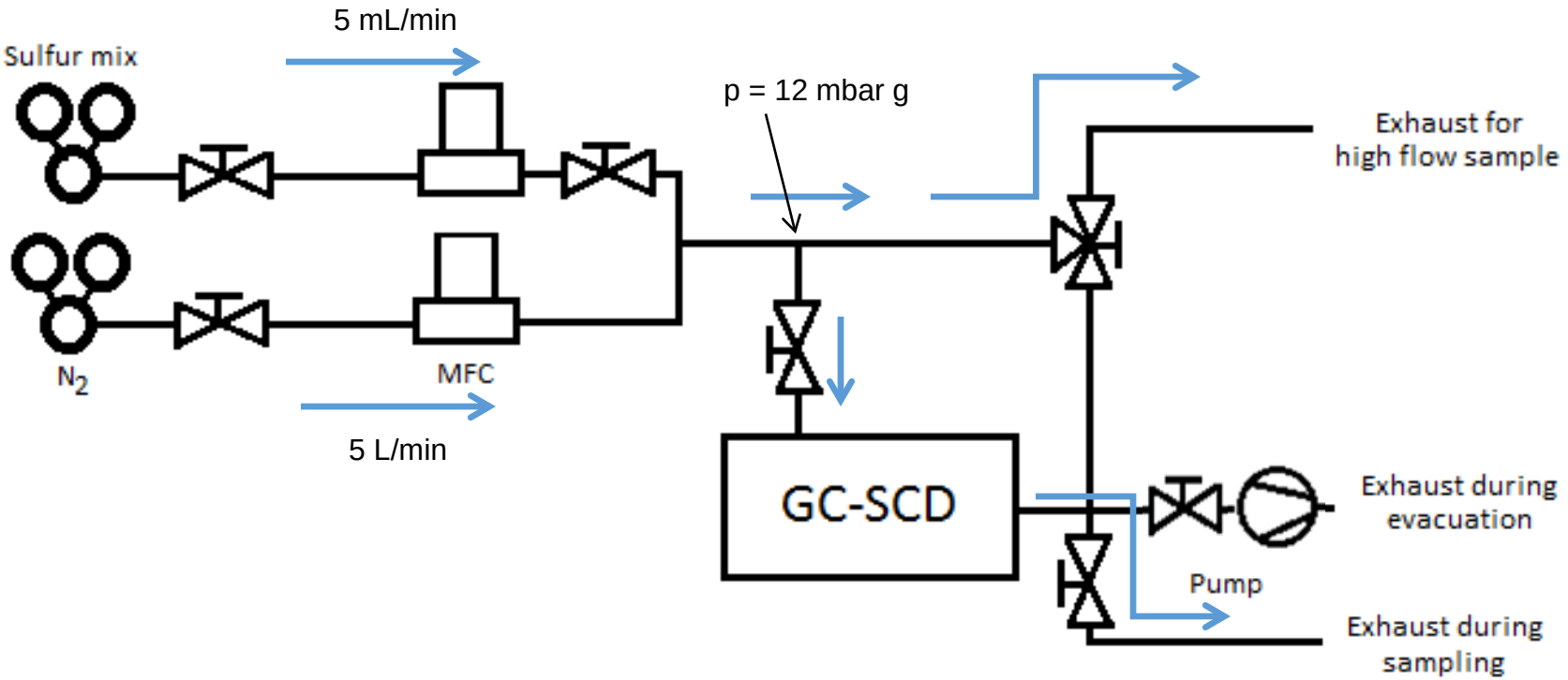
Samples with high H_2 can deactivate the catalyst. A local company diluted our sample by 15:1 because of the 40% H_2 in the sample. Is this necessary?

What is the downside of analyzing a sample with widely different concentrations of sulfur species? (e.g. 300 ppm H_2S and 30 ppb of organic sulfur compound.) Blinding of the detector?

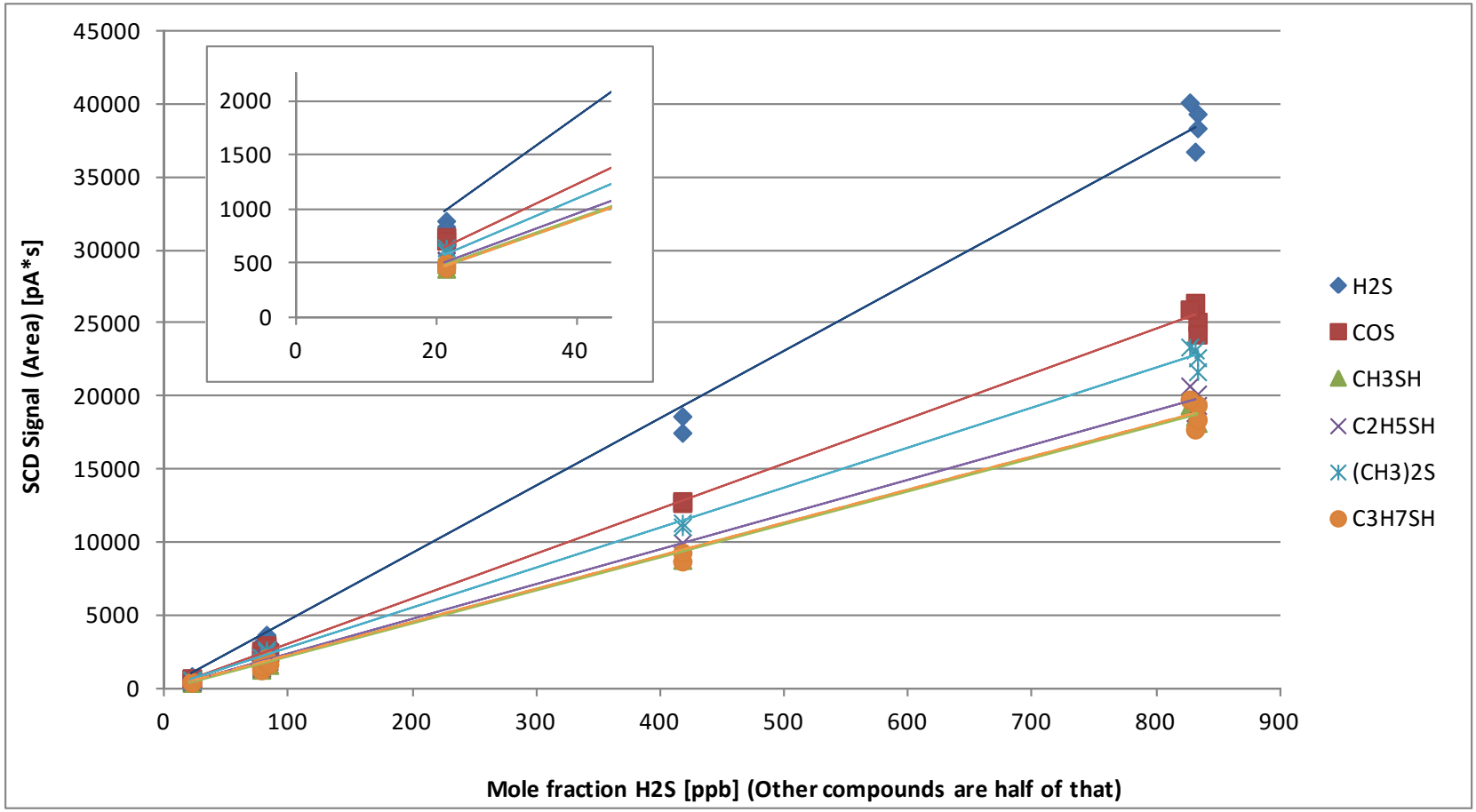


Diluted Cal-gas Setup

Filling of gas-sampling valve with diluted calibration gas (~1000:1 dilution)



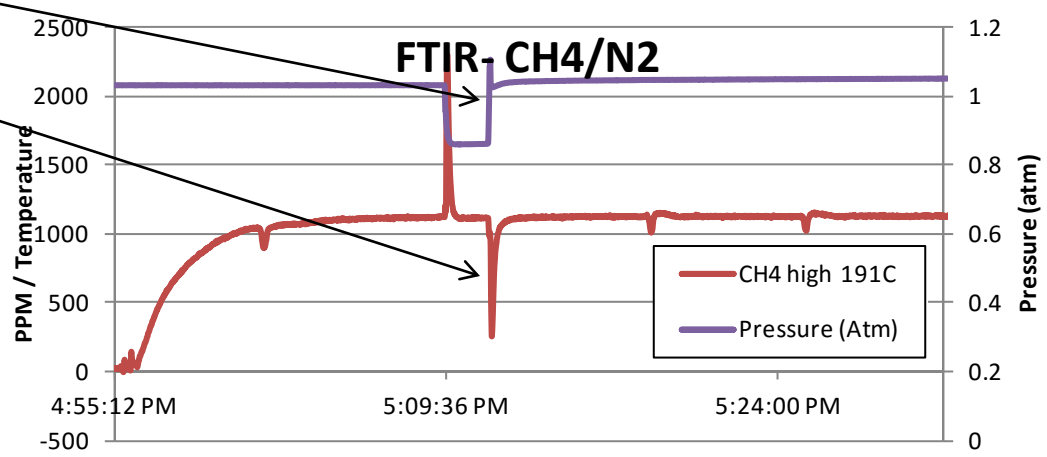
Linear Response with Increasing Concentration



Therefore, at small concentrations (~20ppb), no significant loss of sample was detected.

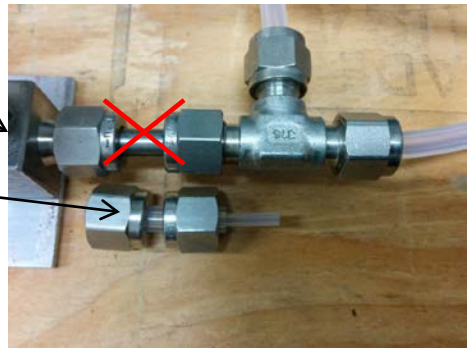
Repeatability for Calibrations of Small Concentration

At high dilution ratios (1000:1), the sample concentration becomes very sensitive to pressure fluctuations, e.g. switching a downstream valve.

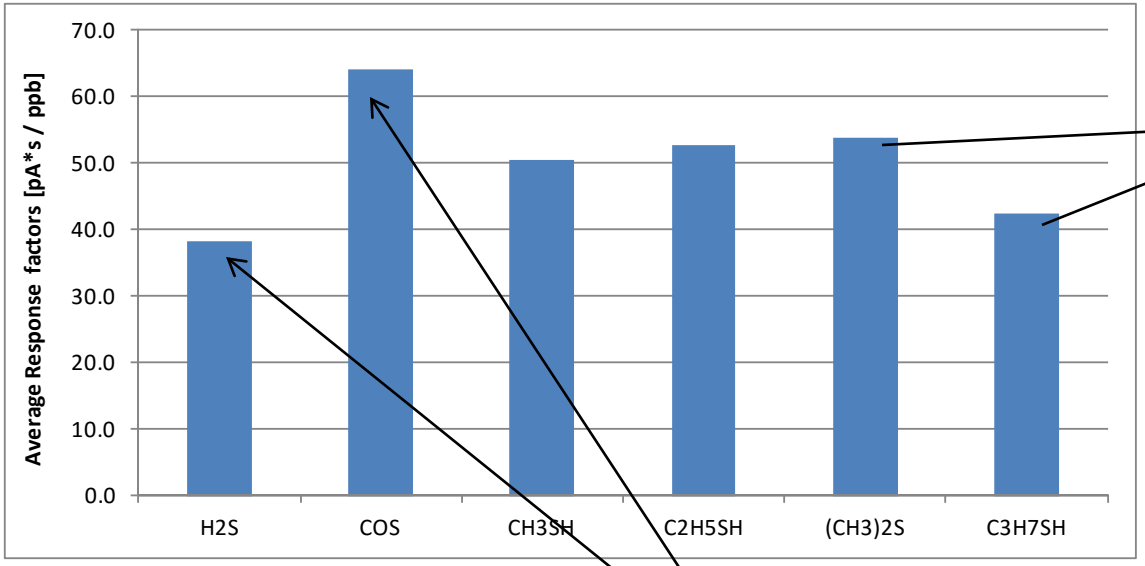


The internal volume of the tubing of the smaller flow will need to be smaller as well.

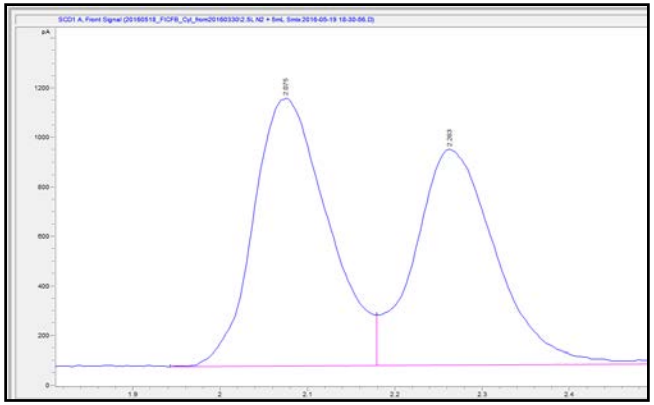
For a 1000:1 dilution, a capillary may be needed.



Response Factors across Sulfur Species



Not all response factors are perfectly equal. It is not clear if the differences across compounds is due to errors in the calibration gas or due to the detector response not being perfectly equimolar.



Differences in H_2S versus COS may be explained in the overlapping peaks (wrong integration), or degradation of H_2S along the sampling path.

Next Efforts

- Setting GC-SCD up for sampling of producer gas. Either by moving it close to sampling location or by using sampling bags. Currently sampling bags have not shown as good of results as the direct connection to the gas sampling valve.

- Testing the repeatability of liquid injection. (Such as impinger liquids for the collection of organic sulfur compounds)