

Laboratory Applications

JP Hsu

SmartChemistry.com

**What are contaminants
normally found in hydrogen
from fueling nozzle?**

Particulates are most common found in Hydrogen - 96% hydrogen fuel contains particulates in 108 Particulate Samplings.

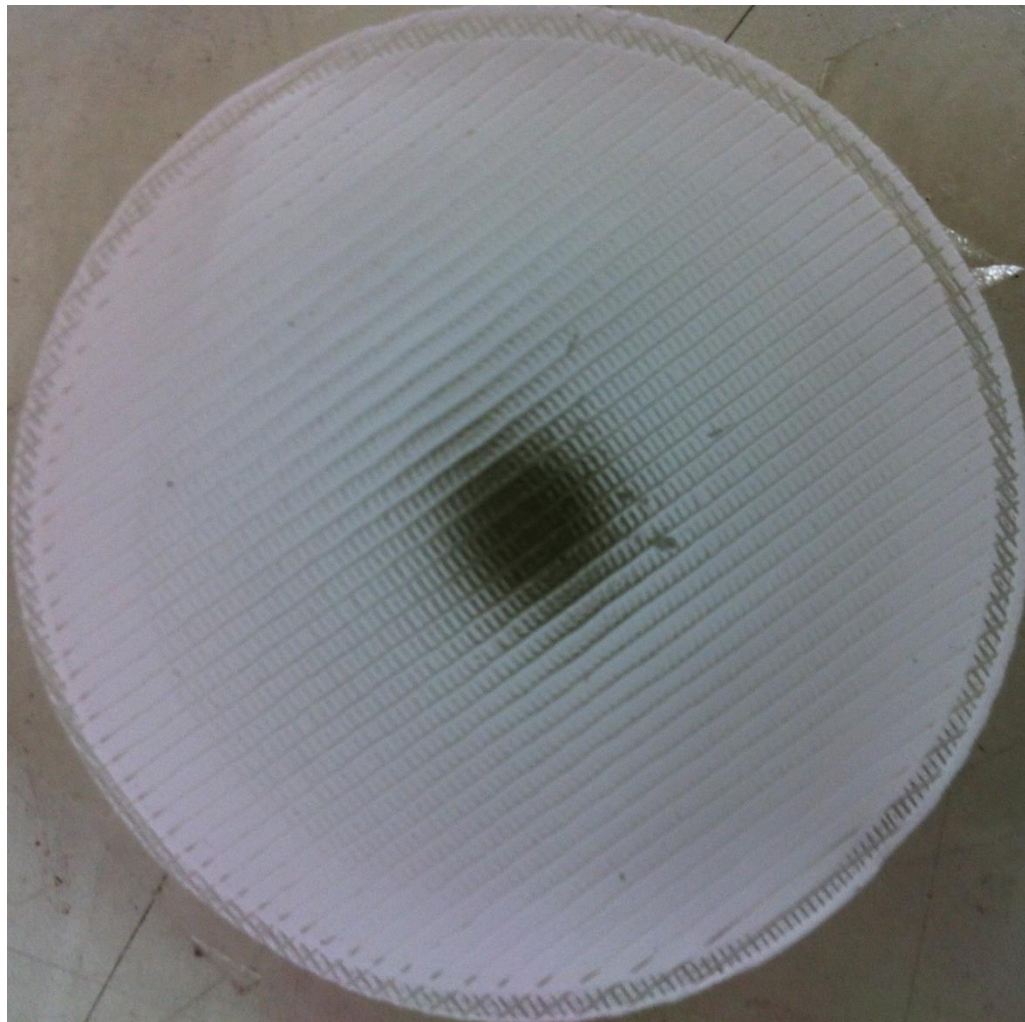
Typical Particulate filter –
0.035mg/kg



H₂ Station X Particulate Sample

Particulate Concentration at 700 Bar: 2.0 mg/kg

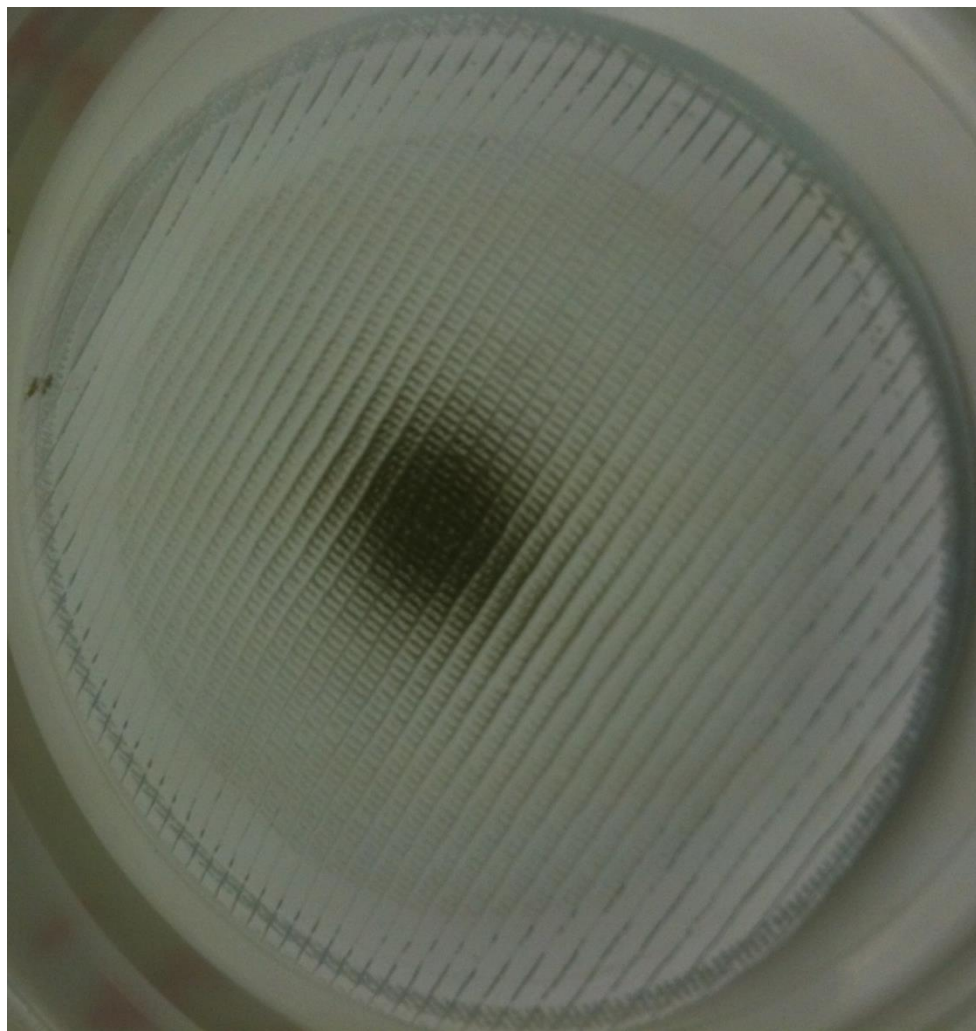
Particulate filter after sampling, in which 4.001mg
particulates are found in 2 kilogram hydrogen



H₂ Station Y Particulate Sample

Particulate Concentration at 700 Bar: 2.02 mg/kg

Particulate filter after sampling, in which 4.031mg
particulates are found in 2 kilogram hydrogen



H₂ Station Z

Particulate Concentration at 700 Bar: > 1.27 g/kg

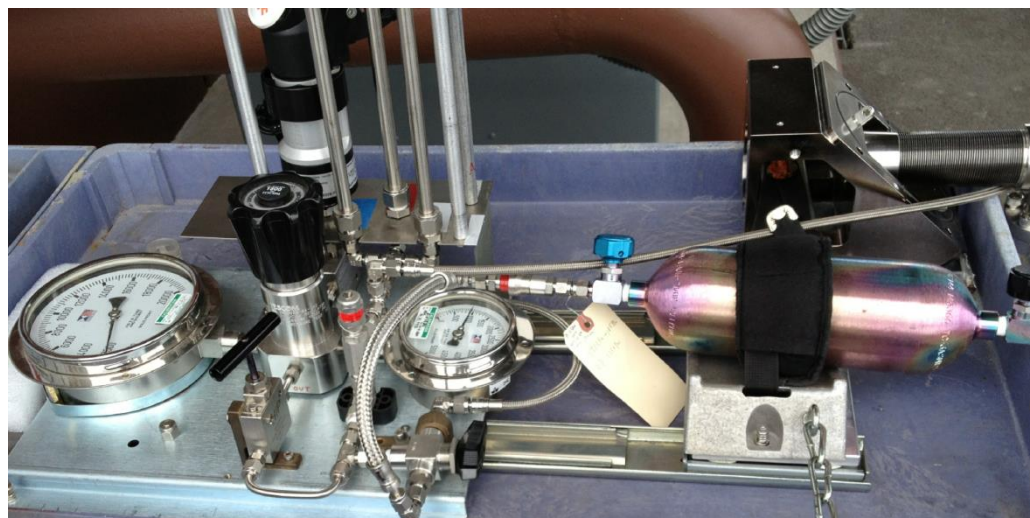
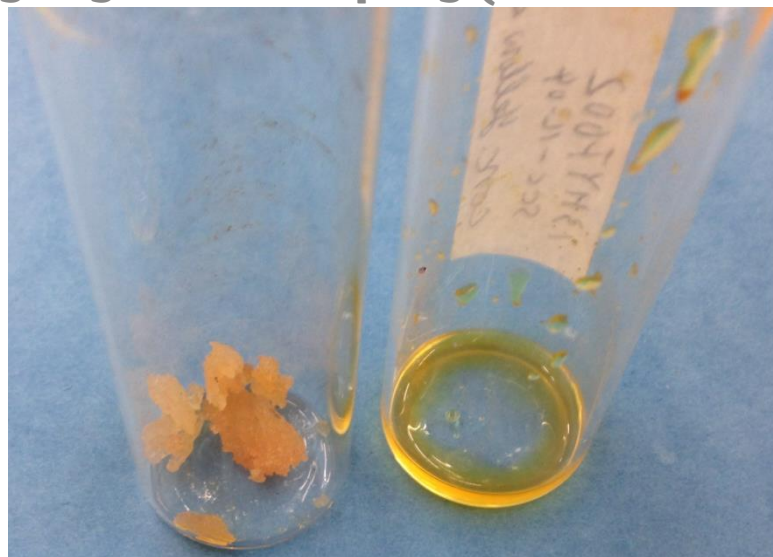
It was found that the sample container severely restricted hydrogen flow at 1000 psi during hydrogen gaseous sampling (ASTM D7606-11)



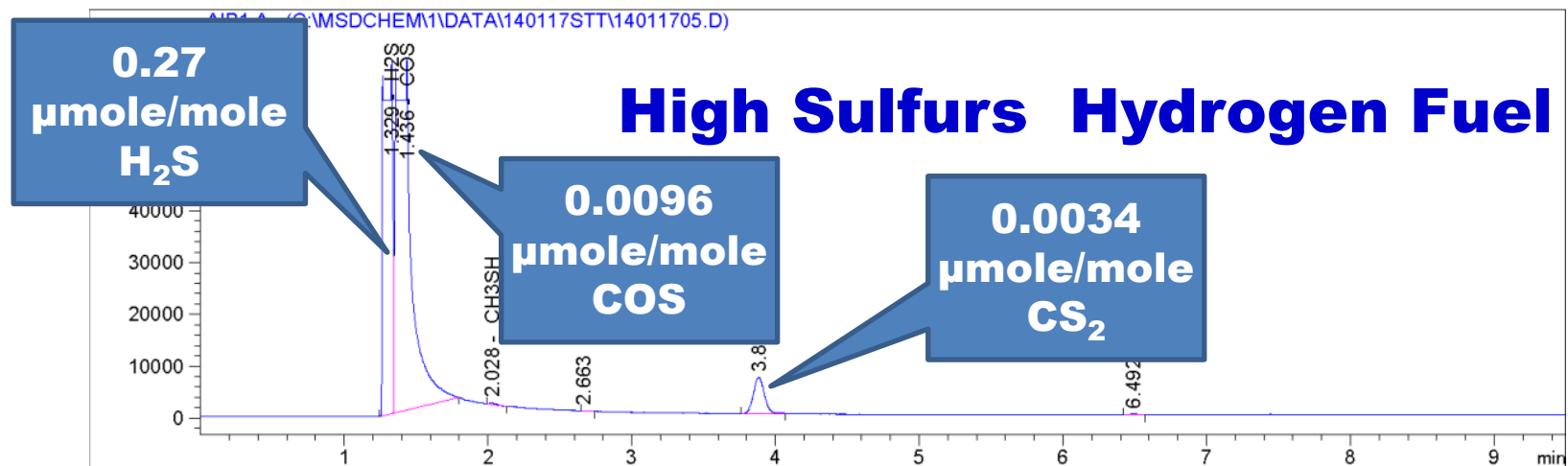
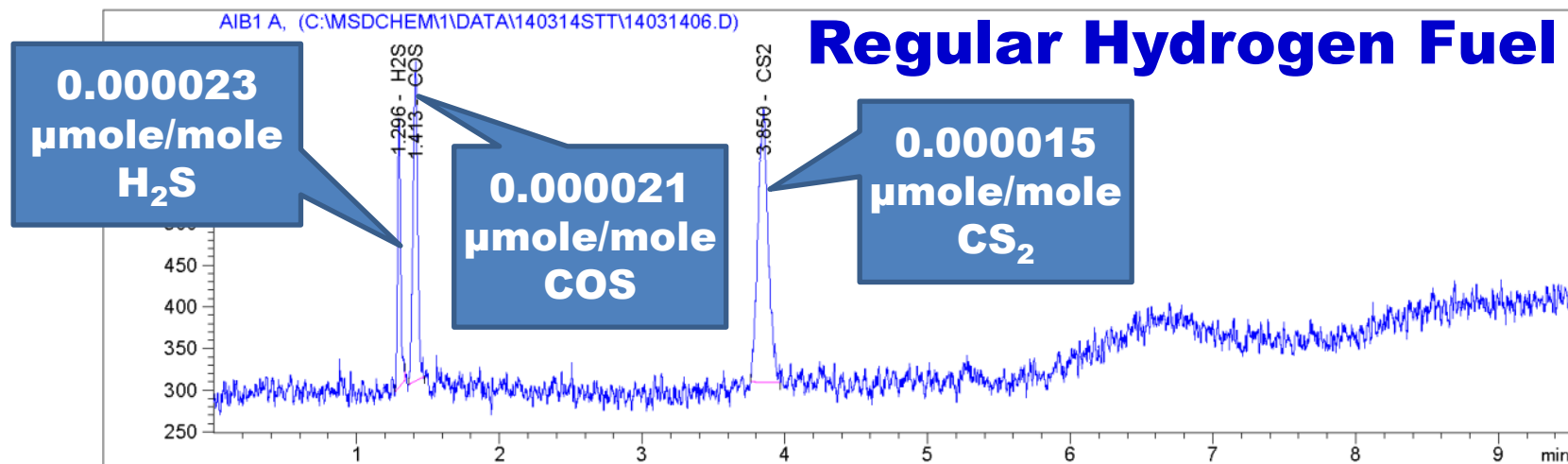
Drying Agent?

- It was found

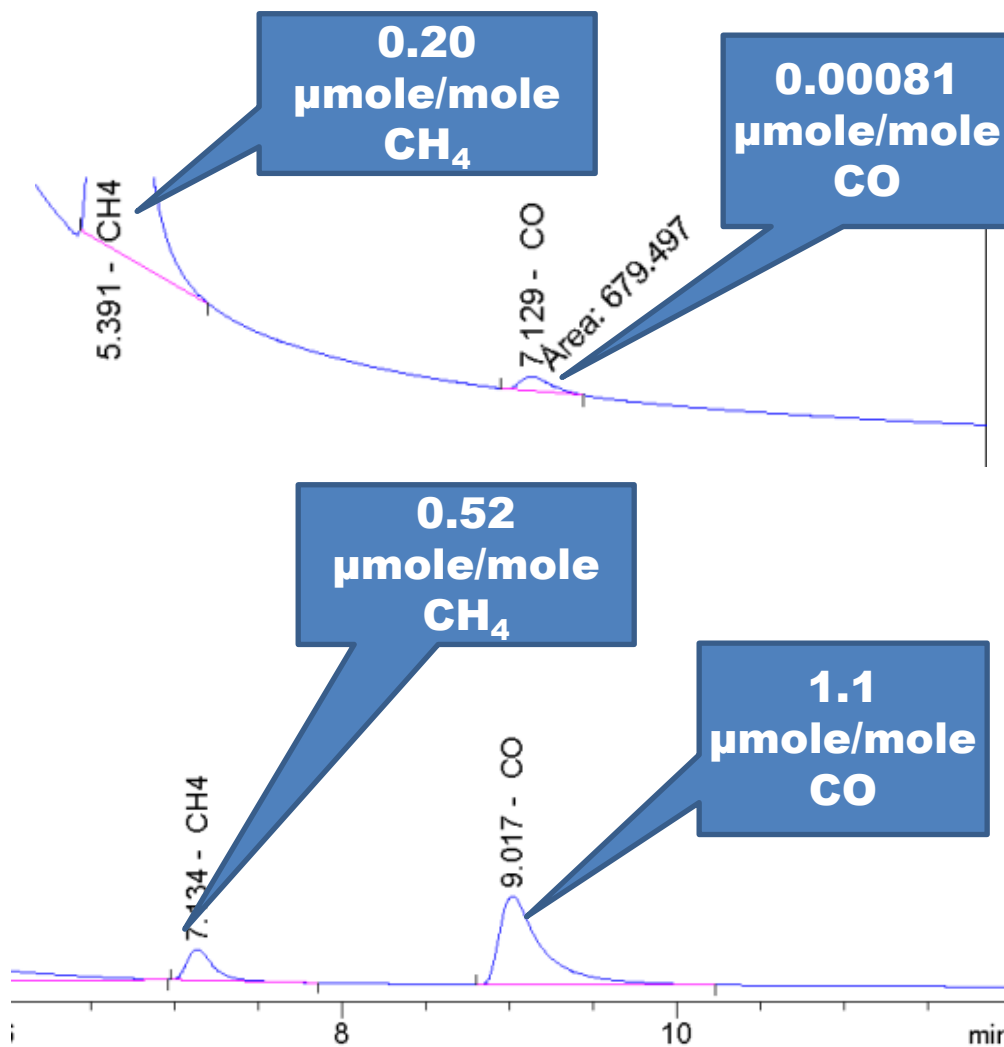
that the sample container severely restricted hydrogen flow at 1000 psi during hydrogen gaseous sampling (ASTM D7606-11). The downstream valve of the sample container was removed upon further investigation. It was found that white solid completely covered the bottom opening of this female 1/4" NPT union. The white solids were very rigid initially and, shortly, absorbed the moisture in air to liquefy partially. The liquid was sticky and it is determined by experience the solid should be drying agent.



Sulfurs – Most of the hydrogen samples contain trace amount of sulfurs; however, high level sulfurs is occasionally found, especially while new stainless steel tubing installed.

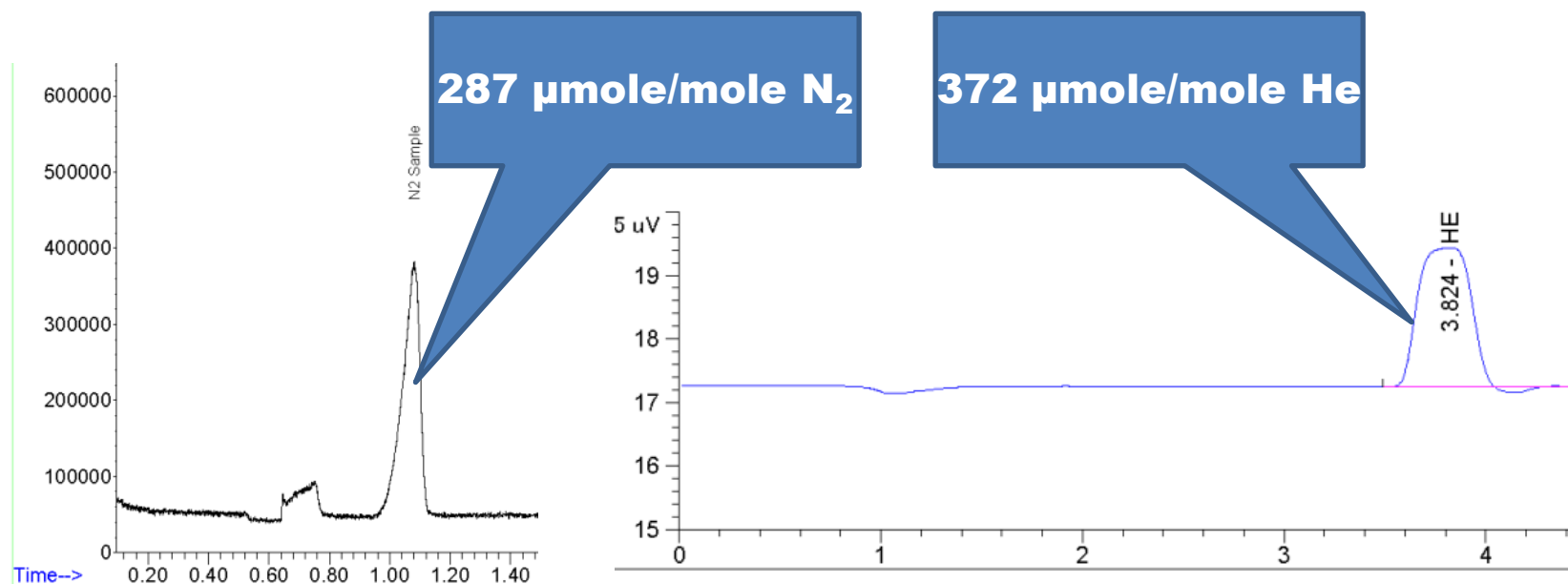


CO – All the hydrogen samples contain trace amount of CO and CH₄; however, high level CO is occasionally found.



N₂ - normally found in new hydrogen fueling stations

He - normally found in hydrogen from SMR



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CO₂, O₂, H₂O, Ar, hydrocarbon (ethanol, isopropanol, etc.), and organic halide (high MW freon, etc.) are frequently found in hydrogen fuel.

Conclusion: All the contaminants mentioned in hydrogen fuel should be monitored frequently.