



Standard H2, Inc.
Your Pollution Solution©
Specializing in:

- 1) Cleaning hydrogen to remove the volatile sulfur compounds that ruin the efficiency and shorten the lifetime of H2 Fuel Cells by reducing the sulfur concentration to below 1 ppb,
- 2) Removing the oxides of nitrogen, H2S, etc. from air and the air intake side of the fuel cell,
- 3) Cleaning natural gas to remove H2S and thiols that corrode boilers, heat exchangers, etc.
- 4) Cleaning biogas for renewable natural gas,
- 5) Trapping NOx at high temperatures such as in diesel exhaust (400+C) or power plant flue gas (700+ C),
- 6) Catalyst guard bed protection,
- 7) Cleansing the bottled gases used in labs and high-tech instruments,
- 8) Cleansing the gases used during computer chip manufacture, etc.
- 9) Cleansing water to remove H2S and other contaminants for H2 electrolysis,
- 10) Cleaning potable and waste water by removing H2S, forever chemicals, etc.,
- 11) Odor removal from arenas and breeding facilities of show animals,
- 12) Gas masks to remove H2S, NOx, halides, foul odors (skunk, etc.).

Here's why sulfur elimination is our specialty:

SAE J2719:2020 "Hydrogen Fuel Quality for Fuel Cell Vehicles" sets the standard. For volatile sulfur compounds the maximum concentration is 4 ppb, the lowest of all contaminations because the 100% correlation between the concentration of catalyst poisoning sulfur and the lifetime and efficiency of the catalyst.¹ This US Standard is very similar to the EU standard.

There is a direct negative relationship between sulfur content in hydrogen (H2) and the lifetime of a catalyst; higher sulfur content in the hydrogen significantly reduces the lifespan of a catalyst due to a phenomenon called "sulfur poisoning," where sulfur compounds bind to the active sites of the catalyst, inhibiting its ability to facilitate reactions effectively.

Key points about sulfur poisoning and mitigation:

- **Mechanism:**

Sulfur-containing molecules like hydrogen sulfide (H2S) readily adsorb onto the active sites of a catalyst blocking other reactants from accessing those sites and hindering the catalytic process. Even small amounts of sulfur can significantly decrease the activity and selectivity of a catalyst leading to a decline in product yield.

¹ https://cdn.ncwm.com/userfiles/files/Meetings/Interim/Pub%2015%20Archive/2023/Supporting%20Docs/FLR-23_3-Quong-2_20-2023/SAE%20J2719.pdf



- **Feedstock purification:**

Removing sulfur compounds from the hydrogen feedstock before it reaches the catalyst is the most effective way to prevent sulfur poisoning.