



Hydrogen and the hazards of hydrogen leaks are present in many areas of semiconductor manufacturing facilities. While the basic need to continuously monitor hydrogen leaks is clear, the proper selection and placement of hydrogen sensors requires careful consideration.

Hydrogen, the lightest of the flammable gases, diffuses rapidly and is colorless, odorless, tasteless and cannot be detected by the human senses. Hydrogen is flammable in concentrations above its Lower Flammable Limit (LFL) i.e 4% by volume or 40,000 parts-per-million (PPM).

If the hydrogen concentration of a supply system leak is kept well below the LFL, the possibility of explosion is prevented. Outside the semiconductor industry, the standard approach is to use a sensor calibrated to detect hydrogen and alarm when the concentrations exceed 25% LFL (10,000 PPM).

Hydrogen, a typical carrier gas, and other hazardous precursor gases are used in chemical vapor deposition (CVD) tools where air exchange rates can quickly dilute leaks- effectively restricting a hydrogen leak hazard to the area near the leak. Accordingly, sensors with an alarm at or below 500 PPM (1% LFL) are preferred to allow for the early detection of a leak. This will help protect systems and operators in case of malfunction/failure in the system and/or gas cabinet

The electrochemical sensor is the preferred technology choice. This sensor offers:

- Appropriately low measurement range (0-1000 ppm or 0-2000ppm)
- Reliable sensing with a high degree of accuracy and selectivity
- Minimization of nuisance alarms in presence of volatile solvents such as isopropanol, acetone, etc.
- 4-20mA output for use with interlocks, or alarms at measurement ranges as low as 250ppm or 500ppm.

The key to hydrogen safety is the proper selection and placement of hydrogen detectors. Sensors may be located in the exhaust duct and will allow continuous sampling of all air moving through the enclosure and out the exhaust.

The sensor should have a built-in relay for use with interlocks or alarm within seconds for dangerous concentration levels above 500 ppm and reset with concentration levels below 250 ppm.

Incorrect application of a hydrogen sensor technology can be a waste of time and money as well as a serious hazard in itself.

However, when employed correctly, hydrogen sensors are an asset to safety programs for semiconductor process equipment.