

UTILIZING NANO TECHNOLOGY GREATLY IMPROVES METAL OXIDE SENSOR PERFORMANCE

The measurement of toxic gases in harsh environments has been well proven using metal oxide sensors. Metal oxide sensors are ideal for many applications because they are inherently rugged and reliable but have historically been problematic in areas of simple, low cost calibration and tendencies to become dormant or to “fall asleep” when not exposed regularly to concentrations of the target gas.

Advanced work in chemi-resistive sensing has been in the area of nanoengineered grain structures. The Net Safety metal oxide H₂S sensor, available with our next generation gas detector, the Millennium II, shows a substantial performance increase as oxide grain size is reduced to the “nano” level. This “nano” effect, in conjunction with advances in materials chemistry produce highly reliable sensors for detection of a wide range of toxic and flammable gases.

Careful control of the material properties at the nanoscale can result in outstanding detection limits, even below 1 ppm. Heated metal oxide sensors undergo surface interactions with gas molecules resulting in a change in electrical resistance of the oxide film. Because the metal oxide film is composed of multiple grains with distinct boundaries, the adsorbed gases have significant electronic effects on the individual grains. The interactions of the electrons of a gas with the electrons of the solid oxide result in a change in electron density on the surface of the oxide, which in turn changes the electrical conductivity of the solid metal oxide film.

The electronic properties of nano-structured oxides depend on particle density, uniformity and grain size, so tailoring of material’s composition and structure to the nanoscale produces improved sensor performance. These nano-structured oxides are also made of proprietary materials and are extremely stable over the entire sensing temperature range and are not negatively effected by sulfur exposure or lack of exposure, which ensures sensor availability with or without exposure to H₂S.

 [more information](#)



Net Safety's nano-structured oxide H₂S sensor exhibits a substantial performance increase and will not “fall asleep”