

With support from the National Institutes for Occupational Safety and Health SBIR Program, Synkera Technologies has completed preliminary development of a sensor technology that it is well suited for the electronic measurement of End of Service Life Indication (EOSLI) in respirator cartridges. The sensors are based upon a unique blend of nanostructured, semiconductor materials wherein the selectivity has been specifically “de-tuned” in order to allow detection of an extremely wide range of toxic gases, including organics, acids, bases, oxidizers and reductants. Compared to the sensitivity to the target analytes, the sensors show approximately no response to carbon dioxide (CO₂) or changing levels of relative humidity.

The combination of these materials with Synkera’s exclusive, patented microsensor platform allows for the fabrication of miniature, robust, reliable sensor chips that are extremely well suited for the target application. The scalable nature of the manufacturing process suggests that sensors could be fabricated and sold in large volumes for extremely low cost.

The sensors utilize Synkera’s patented nanoporous ceramic gas microsensor platform. The platform is fabricated from anodic aluminum oxide, a material containing high aspect-ratio channels (pores) with diameters in the 10 to 100 nm range. These parallel pores, which grow in a self-organized fashion normal to the aluminum oxide surface, result in a structural

material that inherently demonstrates a high surface area approaching 100 m²/g, which makes the material ideal for fabrication of gas sensing devices.

Blank anodic aluminum substrates (approximately 100µm thick) are processed using chemical micromachining techniques to produce a thermally isolated area. Application of gas sensitive compounds and metallic electrodes to this isolated area results in a small yet very robust microsensor element. Throughout the process, the nanostructured nature of the pores is maintained. The consequent high surface area, when combined with the small size of the thermally isolated sensing area, enables production of chemiresistive sensors and sensor arrays exhibiting high sensitivity with low power consumption. Synkera has demonstrated a variety of practical methods for applying gas sensitive compounds to the sensor element, and has demonstrated superior sensing performance for a variety of gas constituents. Additionally, the company has produced microsensor assemblies of up to 6 microsensors on a single substrate, in anticipation of creating application specific sensor arrays.

The response of the sensors to several common classes of chemicals are shown in Figure 1 and Figure 2.

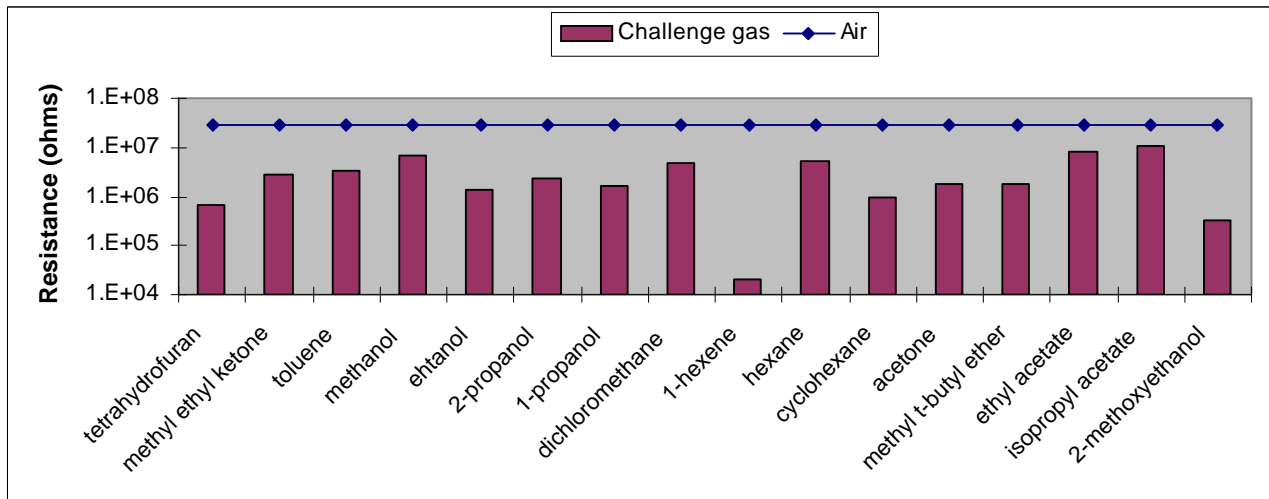


Figure 1: Respirator sensor response to 100 ppm of varying solvent vapors

An image of a blank sensor substrate with 4 sensor elements is shown in Figure 3. The sensor arrays feature room for 4 thermally isolated sensor elements and an array of mounting holes to provide interconnections.



Figure 3: Blank micromachined substrates for sensor arrays.

Joint development partnerships are being sought to further advance and qualify this sensor technology for EOSL applications. For more information, please contact Synkera Technologies.

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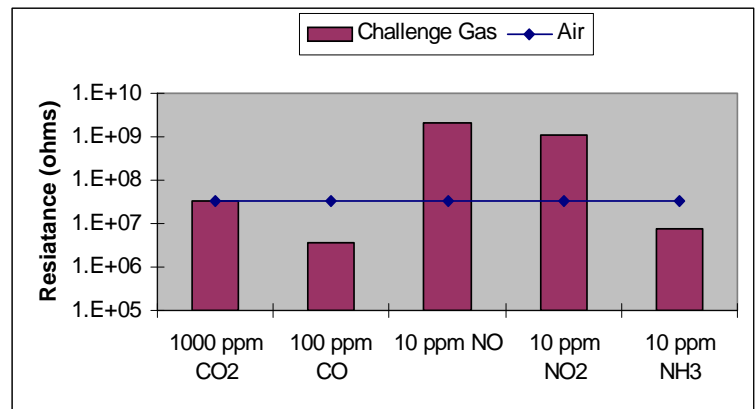


Figure 2: Respirator Sensor Response to a few inorganic gases