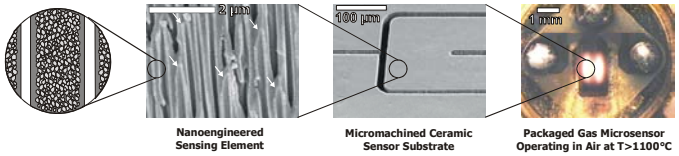
GAS MICROSENSOR PLATFORM

TECHNOLOGY PROFILE

OVERVIEW

Synkera Technologies Inc. has combined its expertise in the areas of ceramics micromachining and gas sensing to produce a *gas microsensor platform* with unique capability. The platform utilizes 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 m^2/g. These features make the material ideal for fabrication of gas sensing devices. Blank anodic aluminum substrates (approximately 100μ thick) are processed using chemical micromachining techniques to produce a thermally isolated area. The as-prepared

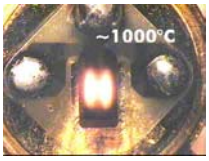


Anodic aluminum oxide based microsensor platform

micromachined alumina, which initially is in an amorphous state, is then thermally processed to produce α or γ alumina ceramic. 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 sensor 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*.

Microsensor elements can be mounted in a variety of ways; currently, they are most commonly packaged on TO-39 headers as shown below. The thermally isolated area can be heated to up to 1000°C without damage, and has a demonstrated lifetime exceeding 10^5cycles.

Mounted sensor element



Element heated to 1000°C

PERFORMANCE SUMMARY

PARAMETER	VALUE / PERFORMANCE
Sensing Materials	Thin (5-50 nm) conformal coating inside high density aligned nanopores, resulting in nanocrystalline sensing material with specific surface area of up to 100 m^2/g
Types of Sensors	catalytic, resistive
Operating Temperature	up to 850°C continuous operation, short excursions up to 1000°C
Power Consumption	as low as 50 mW at 500°C
Temperature Rise Time	100 to 300 ms, design-dependent (90% of temperature setpoint at 300-600°C)
Response Time	from less than 5 to 50 s, depending on the sensing mechanism and operating temperature
Operating Modes	constant temperature, temperature pulse, kinetic temperature modulation (enhanced selectivity), short term sensor regeneration at high temperature
Microheater Stability	pulse mode at 500°C (10% duty cycle): 0.07Ohm /month constant power mode at 500°C: 0.28 Ohm/month
Temperature Cycling	>100,000 cycles from ambient to 500°C
Mechanical Stability	no damage in 5 foot drop test

PARTNERSHIP DEVELOPMENT

Partners are being sought to support commercialization of microsensor products based on this platform. If you would like to discuss this further, or need additional information, please contact:

Debra Deininger
Product Manager
720-494-8401 x105
ddeininger@synkera.com
info@synkera.com