Private Company

Oxygen sensors for sulfur-rich gas streams

Industrial materials

Background

We are a global materials and mining company with deep expertise in metal production, committed to advancing process innovation and operational efficiency across complex industrial systems. Modern sulfide smelting operations, such as flash smelting for copper or nickel, generate off-gas streams dominated by SO_2 and SO_3 at temperatures approaching 1,000°C. Accurate, real-time oxygen measurement in these gas flows is critical for optimizing oxygen input, preventing damage to waste-heat boilers, and detecting maintenance issues before they escalate. However, this gas environment is extremely hot, chemically aggressive, and often laden with particulates, making most oxygen sensors unreliable. Conventional instruments rapidly corrode, foul, or drift, especially when exposed to acid-forming SO_x species or thermal cycling. As a result, many sites operate without live oxygen data, relying on experience instead of real-time feedback. This leads to inefficiencies in fuel use, increased equipment wear, and missed opportunities for predictive maintenance. A rugged sensing solution that survives this harsh chemical and thermal environment would unlock continuous optimization and early-warning maintenance analytics.

What we're looking for

We are looking for technologies that can continuously measure oxygen concentrations at the waste-heat boiler feed/outlet and electrostatic-precipitator (ESP) outlet of non-ferrous smelters, while operating directly in hot, sulfur-rich off-gas environments that can reach temperatures up to 1,000 °C.
Solutions of interest include:

- Solid-state zirconia or gallia electrolyte instruments with SOx-resistant coatings
- Through-duct tunable-diode-laser absorption (TDLAS) oxygen analysers
- Sapphire-shielded fibre-optic phosphorescence or luminescence O_2 sensors
- Extractive analysers with ultra-fast quench and corrosion-proof flow paths
- Regenerable catalytic or plasma-based sensors with in-situ cleaning cycles

Our must-have requirements are:

- Capable of operating reliably in sulfur-rich gas environments containing ≥ 90% SO_2/SO_3
- Capable of operating at temperatures typical of downstream process units, such as the ESP outlet, in the range of 400–500 °C

Our nice-to-have's are:

- Operates at process-inlet temperatures near 1,000 °C, such as at the waste-heat boiler feed

Acceptable technology readiness levels (TRL): Levels 4-9

1. Basic principles observed
2. Concept development
3. Experimental proof of concept
4. Validated in lab conditions
5. Validated in relevant environment
6. Demonstrated in relevant environment
7. Regulatory approval
8. Product in production
9. Product in market

What we can offer you

Benefits:

Sponsored Research

Up to $100,000 for a proof of concept, with additional funding possible for further development. For higher-TRL solutions, we may purchase a single unit for on-site trials.

Expertise

Collaborate with metallurgical processing experts to define application fit and iterate designs.

Facilities and Services

Opportunity to trial or demonstrate technology on real process streams at company sites.

Please contact the University of South Florida Technology Transfer office representative for submission - Karla Schramm at kschramm@usf.edu