ALBERTA INNOVATES

CLEAN ENERGY

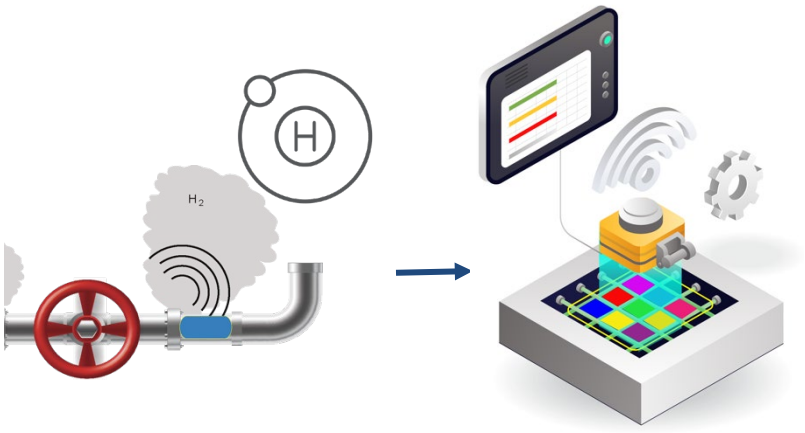
CLEAN TECHNOLOGY

HYDROGEN CENTRE OF EXCELLENCE

FUNDING DETAILS

Development of Cost-Effective Colorimetric Sensors for Real-Time Detection of Critical Gas Leaks (H_2, CO_2, CO, NH_3, H_2S)

The University of Alberta, with support from Alberta Innovates, is developing a first-of-its-kind, cost-effective colorimetric gas sensor capable of accurately detecting critical industrial gases such as hydrogen (H_2), carbon dioxide (CO_2), carbon monoxide (CO), ammonia (NH_3), and hydrogen sulfide (H_2S). This innovative sensor utilizes specific interactions between target gases and a polymer coating to produce distinct and visible color changes, enabling rapid and intuitive leak detection. In addition to its visual readout, the sensor offers high reliability and low power consumption, making it well-suited for continuous monitoring in industrial environments. Designed specifically for hydrogen gas compression stations and adaptable to a variety of industrial settings, the sensor coating can be applied to diverse surfaces, including metals, plastics, and filter paper, offering versatility and scalability for widespread deployment.



RECIPIENT:
University of Alberta

PARTNERS:
Valmax Tech. Corp., NRCan

TOTAL BUDGET:
$803,000

AI FUNDING:
$514,000

PROJECT DATES:
APR 2025 – DEC 2027

PROJECT TRL:
Start: 3
End: 7

APPLICATION

Alberta's plan to transport pure hydrogen and other industrial gases to domestic users, and for export to other provinces and countries, raises increasing concerns about public safety and the risk of gas leaks. Detecting toxic and flammable gases is essential for ensuring a safe and sustainable future. The University of Alberta is addressing this challenge by developing a color-based leak monitoring technology for oil and gas infrastructure that reduces risk and removes uncertainty. This low-cost, selective, and real-time detection system is designed for critical industrial gases such as H_2, CO_2, CO, NH_3, and H_2S. With multi-sensor integration, this technology offers unmatched advantages for industrial monitoring and has broad applications in environmental protection, food quality control, and public safety.

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PROJECT GOALS

- Development of color sensor-based gas leak detection system.
- Feasibility study of visible color sensor readiness for H_2, CO, CO_2, NH_3 and H_2S gases
- Development of a novel coating material that triggers a distinct color transformation upon contact with targeted gases.
- The coating sensors can be effortlessly applied to diverse surfaces, enabling the analysis of specific gas presence and concentration simply by observing the color shift, both qualitatively and quantitatively.
- The study focus is on a multi-sensor platform integrated with machine learning and artificial intelligence-based color reading devices for qualitative and quantitative analysis of colorimetric gas sensors.
- Exploration of technology transfer to private industries for potential deployment if it proven viable.

BENEFITS TO ALBERTA

- Advancement of technologies aligns with Alberta's Emissions Reduction and Energy Development Plan,
- Identifying new opportunities for economic growth by developing local markets and expanding Alberta-based manufacturing and sensor technology exports.
- Diversifying Alberta's economy through the development of cutting-edge gas sensing technologies.
- The project positions Alberta as a leader in clean energy technology, attracting domestic-international attention and investment.
- The sensors' early detection capabilities reduce environmental risks, support Alberta's emissions reduction targets and fostering sustainable industrial growth.

5 New Products/Services

Potential for capital investment being explored

20-30 Future Jobs

Up to 3 Mt CO2e/y Potential Reduced

CURRENT STATUS

JUN 2025

The study is currently in its initial phase, focusing on the procurement of instruments, fabrication of sensor materials, formulation development, assembly of the detection system, and planning for knowledge dissemination.