

**TECH OFFER**

## Spectrometry-Based Electronic Nose for Odour Mapping and Analysis



### KEY INFORMATION

**TECHNOLOGY CATEGORY:**

**Electronics** - Sensors & Instrumentation  
**Environment, Clean Air & Water** - Sensor, Network,  
Monitoring & Quality Control Systems  
**Green Building** - Indoor Environment Quality  
**Infocomm** - Smart Cities

**TECHNOLOGY READINESS LEVEL (TRL):** **TRL7**

**COUNTRY:** **SINGAPORE**

**ID NUMBER:** **TO175322**

### OVERVIEW

With increasing discoveries of new pollutants being detrimental to human health and the environment, there have been an increasing scrutiny of air quality and industrial emission in urban settings through tighter government regulations. With the increasing importance to detect different combination of analyte concentrations within an area, there is a growing demand for electronic olfactory system. Laboratory multi-analyte analysis method, like gas chromatography and mass spectrometry (GC/MS), provide high accuracy and selectivity but is time consuming, not portable and only provide point sampling. Comparatively, industrial gas sensors, like micro-electromechanical systems (MEMS), are portable and simple but lack the selectivity of chemical substances and do not provide analysis capabilities on-site.

The technology owner has leveraged on Field Asymmetric Ion Mobility Spectrometry (FAIMS) with a proprietary odour analysis

system built on extensive experimental data to develop a compact, user-friendly spectrometer for real-time multi-analyte detection, measurement and analysis. The solution offers higher accuracy and selectivity than industrial gas sensors while enabling continuous, non-invasive analysis. With its portable formfactor, the solution enables multiple on-site point samplings for odour mappings for value-added visibility and objective insights.

The technology owner has completed numerous pilot test locally and overseas from industrial, aromatics and healthcare use-cases and is actively developing for their commercialisation. The technology owner is currently seeking industrial collaborators looking to explore digital olfaction devices for on-site odour mapping and real-time multi-analyte analysis deployment, with a focus on urban odours.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The device solution utilises FAIMS (Field Asymmetric Ion Mobility Spectrometry), which separate individual gas molecules via ionisation and varying electric field and identifies them via electrical signals. Previously limited to only specialised environments, the technology owner has leveraged on proprietary algorithm of data analysis to develop a deployable device for broader usability. The key features include:

- High sensitivity and selectivity for individual analytes
- Both battery/ socket powered option to deploy device (as an IoT) on site.
- Compact and portable formfactor (~3kg) with current prototype being 120mm (H) × 220mm (W) × 160mm (D)
- User friendly with no in-depth technical expertise required
- Real-time multi-gas measurement and analysis for on-demand actionable insights
- Continuous, non-invasive sample delivery design using integrated pump design for sampling frequency up to 1Hz.
- Software user interface (UI) for viewing, cloud data transmission, computing and visualisation for horizontal usage across various application
- Stable operation with minimal consumables and ease of maintenance due to robust non-adsorptive sensing principle

## POTENTIAL APPLICATIONS

With the capability of deployable laboratory multi-analyte detection and analysis, the technology solution is designed to enable various odour-centric application across different industries such as:

- **Environmental Monitoring for Urban Setting:** Monitoring and mapping of ambient air pollutants, contamination detection and source analysis, cleanroom contamination and visualisation, and odour monitoring in confined environments (e.g. cabin air, tunnel)
- **Gas/Solvent-based Industrial & Manufacturing Processing:** Monitoring, leak detection and mapping of odour (e.g. for exhaust and waste gas), odour detection and control, and solvent analysis and contamination evaluation
- **Healthcare and Wellness:** Non-invasive biomarker analysis for disease/ health diagnostics, management of chronic conditions, and effectiveness testing
- **Food & Beverages:** Odour detection and mapping within establishments, maintenance of food hygiene, freshness evaluation and control, and authenticity assessment of products
- **Logistics:** Monitoring of perishables, and packaging defect detection
- **Agriculture:** Quality assessment of produce, and insights and predictive maintenance of optimal growth conditions

## MARKET TRENDS & OPPORTUNITIES

The global electronic nose (e-nose) market is expected to be valued at US\$972 million in 2024 and is projected to reach US\$1,617 million by 2029, exhibiting a CAGR of 10.7% during the forecast period.

Across application segments within the global e-nose market, medical application is projected to be the largest market share in 2029 of US\$665 million while environmental monitoring application is expected to exhibit the largest CAGR of 12.1% during the forecast period of 2024 to 2029.

## UNIQUE VALUE PROPOSITION

The technology solution is designed to leverage the advantages of FAIMS and MEMS technology to develop the odour sensor system capable of high sensitivity and selectivity while being compact, portable and user friendly. With the continuous real-time multi-gas analysis on site, the system provides detect, measure and analyse odours coupled with AI based analytics, such as odour profiling, for quick insightful decision-making. With capabilities to objectively visualise and evaluate odours in real-time, it opens the future of odour sensing across various use-cases, from potentially detecting new hazardous odours for public safety to disease diagnostics via breath analysis.