

Electronic Nose (E-Nose) - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2025 - 2030)

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Report description:

The Electronic Nose Market size is estimated at USD 146.28 million in 2025, and is expected to reach USD 282.88 million by 2030, at a CAGR of 14.1% during the forecast period (2025-2030).

An electronic nose is a technology utilized to explore biological olfactory function. It is used to distinguish complex volatiles, which can reproduce the structure and principle of the olfactory sense. With the development of society, the importance of olfactory application in the food industry, environmental detection, and medical treatment is increasing.

- The electronic nose has significant application value in identifying odors like wine, vegetables, cigarettes, etc. It is widely employed in odor detection, raw material inspection, quality signing, and sprinkling process management. It is also one of the indispensable tools for quality assurance and quality control. It is primarily used for maturity detection and species identification in fruit and vegetable testing.

- The e-noses have been around for several years but are typically large and expensive. The market is witnessing ongoing research focused on making the devices smaller, less expensive, and more sensitive. The smallest version of these solutions consists of a nose-on-a-chip, a single computer chip containing both sensors and processing components. Currently, industries perform tests with the help of gas chromatographs and human experts to test the flavors and scents of goods during production and measure their levels of freshness and damage.

- Technological advances, such as the cloud, AI (Artificial Intelligence), and the IoT (Internet of Things), have positively influenced the need for electronic nose technology. These advancements have been dynamic and have enhanced computing systems, one of the critical elements of the products in the electronic nose industry. The growing ability to bring Artificial Intelligence (AI) into the

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procedure of small, embedded sensor systems is creating significant opportunities for developers of e-noses. Instead of using a traditional algorithm to discriminate among sensor readings, machine learning helps train the system for a specific task.

- The market for e-noses is growing due to the introduction of neuromorphic and AI technologies and their growing adoption in various industries. However, the device's high initial cost is restricting its growth.
- The number of e-noses sold by various manufacturers depends on the technology basis of instruments, application needs, and, most importantly, the costs per unit. The devices are large and have high development costs, which reflects the high initial costs.
- Besides the direct impact on various market verticals studied, the global pandemic is also anticipated to have a long-term effect. For instance, since the pandemic outbreak, economies of multiple countries are still unable to recover as expected, which is bringing a shadow of economic recession, especially in North American and European regions. For instance, according to the International Monetary Fund (IMF) estimates, the real GDP growth of the United States is anticipated to remain in a slowdown phase till 2024 before regaining momentum again.

Electronic Nose Market Trends

Healthcare Sector to be the Fastest Growing End-user Vertical

- Digital scent technology in e-noses has shown massive potential in the healthcare sector. Healthcare is regarded as one of the end-user verticals where research activity is highly active. For instance, e-noses are being tested to detect diseases by sensing blood glucose levels in patients' breath.
- Scientists/researchers have also been exploring ways to detect signs of cancer by analyzing patients' breaths. Diagnosing cancer, which usually involves various imaging techniques and tissue examination, can be replaced with e-nose technology, which detects the signs of cancer just by analyzing breath. This way, hospitals and diagnostic centers may not incur considerable investment in imaging technology. In addition, the e-nose method is a safer and less invasive method for cancer detection.
- In August 2024, researchers from multiple institutions conducted a Phase II clinical trial to evaluate the efficacy of electronic-nose (E-nose) technology in diagnosing early-stage lung cancer in real-world scenarios. Their findings reveal that the E-nose technology boasts impressive sensitivity and specificity, positioning it as a viable alternative to invasive biopsies for thoracic malignancies. The study involved 100 participants, aged between 21 and 85, all referred to the hospital with a lung nodule. The results showed that the E-nose's diagnoses aligned with histopathologic results in 86% of the cases. This led to an impressive F1 score of 92.5%, derived from 86 true positives, two false negatives, and 12 false positives.
- Research findings indicate that the E-nose could significantly enhance existing lung cancer diagnostic techniques, offering a noninvasive approach that poses no risk to patients. The E-nose consistently identified early-stage lung cancer and demonstrated high accuracy when benchmarked against established imaging methods.
- Rising instances of chronic diseases around the world are also providing a significant boost to market growth. For example, using a device called the electronic nose, doctors and researchers at the AIIMS are trying to identify the signature of lung cancer created by VOCs exhaled. It is expected to help in the early detection of lung cancer in developing countries, like India, where people reach healthcare facilities in the late stages.
- According to the American Hospital Association, the United States is projected to see the number of individuals with chronic medical conditions rise to 164 million by 2030 and further to approximately 171 million by 2050. In addition, according to the American Cancer Society, in 2024, the US is projected to witness 234,580 new cases of lung and bronchus cancer, with Florida anticipated to report the highest number. The data highlights the state-wise distribution of these estimated new cases across the United States in 2024.

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North America Holds Significant Market Share

- North America holds a significant share in the market studied due to factors such as developed infrastructure and the availability of resources, which have enabled the adoption of e-nose technology in applications such as defense, healthcare, and food and beverages, among others.
- In July 2024, the NASA Breath Diagnostics challenge invited experts to create a classification model capable of distinguishing between the breaths of COVID-positive and COVID-negative individuals, utilizing existing data. The overarching aim is to enhance the accuracy of NASA's E-Nose device, positioning it as a viable clinical tool that delivers diagnostic results derived from the molecular makeup of human breath.
- The region is also home to a significant food and beverages industry, which is highly regulated. This is where the e-nose technology finds a prime opportunity for growth. In July 2024, researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences in the US developed a new e-nose. This innovative device can swiftly and accurately detect volatile compounds, including the commonly found VOCs.
- Notably, this sensor is the first to integrate both passive and active sensing capabilities, and it employs machine learning to discern a variety of molecules and their combinations. A feature of their design is its biologically inspired sniffing mechanism. The research findings indicate that this new approach significantly enhances the detection capabilities of artificial noses, paving the way for diverse applications such as identifying food spoilage.
- The demand for e-nose technology is high in the food and beverage industry, as it can detect the freshness of food items, such as meat and poultry products. This helps accurately determine the longevity of food items and reduces the amount of food wasted. According to the US Census Bureau, US food and beverage stores recorded an estimated monthly retail sales figure of around USD 90.3 billion in December 2023.
- The red meat and poultry industry has witnessed unprecedented growth. According to the USDA, in 2023, per capita consumption of red meat (beef) in the United States reached 57.6 pounds, and it is expected to reach 113.3 pounds per capita by 2032. The industry must follow strict regulations in handling and processing meat to maintain food hygiene and minimize food recalls, which is expected to create a demand for the e-nose market.

Electronic Nose Industry Overview

The electronic nose market is semi-consolidated, with several players like Alpha MOS, Plasmion GmbH, Odotech, Airsense Analytics GmbH, NASA, etc. The market companies aim to develop advanced products and processes and strengthen their supply chains to cater to consumers' complex and evolving needs.

Since the market has a presence of primarily domestic players, companies adopt diverse strategies to gain substantial shares and compete vigorously in the market. Companies innovate regularly to gain an edge over other players in the market. Independent researchers with breakthrough innovations are likely to incubate and commercialize offerings.

With growing opportunities across the healthcare domain in light of COVID-19, the development of associations, vendors, researchers, and universities at large is increasing, triggering innovation practices further.

Additional Benefits:

- The market estimate (ME) sheet in Excel format
- 3 months of analyst support

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