

The E-nose

Biomedical Engineering Seminar ELE 282

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The E-nose is an electronic nose, which can detect an odor using gas sensors and computer software. The E-nose has many applications in numerous fields, one of the first applications it had was on STS-95 space shuttle mission in October of 1998. It monitored the mid-deck air continually for over six days and took data samples every 3 seconds. Since then companies and universities have found many other ways it can be used.

Perhaps the most developed E-nose is the Cyrano electronic nose developed by Cyrano Sciences in Pasadena California. This particular E-nose is the size of a mobile phone which can detect smells, and odors as well as identify what they are. This electronic nose acts like a human nose would. The human nose contains around one million receptors that are stimulated by odors. These receptors send signals to the brains olfactory bulb, where the brain organizes the signals to determine the smell. Although the E-nose contains 32 receptors it still goes through the same process to distinguish an odor.

The Cyrano nose contains a chip made up of 32 sensors, composed of conducting particles spread throughout a polymer matrix. When an odor is taken into the nose the receptors react with the vapors by differentially absorbing the chemicals. When this occurs the polymer matrix expands changing the resistance of the composite, which changes the electrical resistance read by the detector.

A sensory array, consisting of 32 different polymeric composites, can

respond to the gas as a group to determine a specific set of signals. The collective array of these 32 different resistances designs a specific pattern of electrical signals, which is stored and can be detected anytime the device encounters the same chemical again. Furthermore, the amplitude of the signal can be used to determine the amount of the unknown substance being detected.

In the medical field this electronic nose is being used to detect and identify certain chemicals excreted from the body, to determine certain skin diseases or urinary infections. "When bacteria eats red blood cells and nutrients in the blood, it gives off waste products just like people do," said Christopher Morong, a senior at Illinois Institute of Technology . "Each bacteria has a specific metabolism and so produces a specific odor."

Scientists at Cranfield University are experimenting with the e-nose to diagnose a urinary infection faster and more accurately. By drinking a specific solution an infected urinary system will immediately react with the solution causing the compounds to release characteristic odors that can be detected by a sensor device, leading to a quick diagnosis and earlier treatment of the patient. Other medical projects with the E-nose have dealt with pulmonary infections, and bandages that can detect if an infection is occurring. It has also been used outside the medical field used to monitor goods in the food industry, as well beer manufacturers to determine the quality of the hops they use.