

New Electronic Nose with Biodegradable Polymer

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In News: Scientists have developed an electronic nose with biodegradable polymer and monomer that can detect hydrogen sulphide (H₂S), a poisonous, corrosive, and flammable gas produced from swamps and sewers.

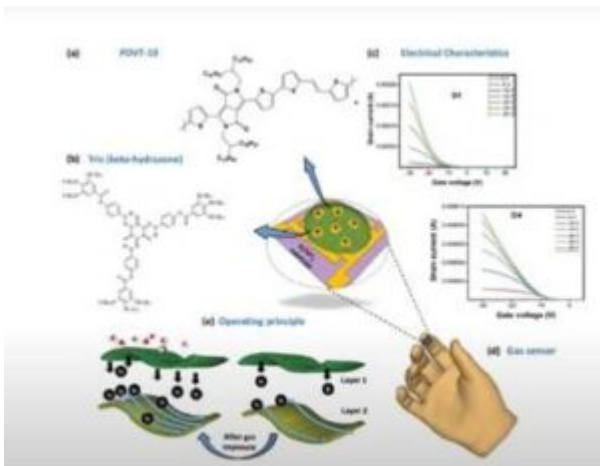
About New Electronic Nose

- H₂S is the primary gas produced from the microbial breakdown of organic matter in the absence of oxygen, and this necessitates easy detection of its emission from sewers and swamps.
- Scientists from the Centre for Nano and Soft Matter Sciences (CeNS), Bangalore, in collaboration with their counterparts from Saudi Arabia.
- Developed an exceptionally sensitive and selective H₂S Gas sensor developed by impersonating the neuron responsible for identification of airborne molecules or olfactory receptor neuron (ORN).

Mechanism of Action New Electronic Nose

- The impersonation of ORN with the help of an organic electronic device consisting of biodegradable polymer and monomer.
- The fabricated sensor consists of a heterostructure consisting of two layers
 - **The top layer:** A monomer and realized with a novel chemical tris (keto-hydrazone), which is both porous and contains H₂S specific functional groups.
 - **The bottom layer:** Is the active channel layer which plays a key role in altering the current and mobility of charge carriers.

- Thus the synergistic combination helps to pre-concentrate the H₂S molecules, initiate an acid-base chemical reaction, and thereby brings a change in the majority carriers (holes) of the channel region in the device.
- The capacitance sensor (a sensor that detects nearby objects by their effect on the electrical field created by the sensor) developed by the scientists showed an excellent sensitivity in detecting H₂S gas with an experimental limit of detection of around 25 parts per billion.
- It also has high ambient stability of around 8 months without compromising sensing performance.



Biodegradable Polymers

- Polymers which get decomposed under aerobic or anaerobic conditions, as a result of the action of microorganism/enzymes.
- The materials develop it like starch, cellulose, and polyesters.
- Aliphatic polyesters are the most commonly used polymers of this type.
- **Examples Of Biodegradable Polymers:** Poly β -hydroxybutyrate – co- β -hydroxy valerate (PHBV), Nylon 2–Nylon 6, Polyhydroxybutyrate (PHB).

Non-Biodegradable Polymer

- Consist of long chains of carbon and hydrogen atoms.
- These molecules form an interatomic type of bonding and are adamant meaning it is tough for microbes to break the bonds and digest them.
- Thus a long period is required to decompose them.

Examples Of Non-Biodegradable Polymer: Polyethene, Poly (tetrafluoroethylene) (PTFE) (Teflon).