**Editorial**
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# Charge Transfer in Organic Heterojunction Gas Sensors is affected by Electrode Shape and Bias, Sensors

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## Editorial

The performance of conduct metric gas sensors can be enhanced by taking advantage of organic heterojunction effects in electrical devices, which is a key method for increasing electrical conductivity. The current study examines the development of organic heterostructures in a bilayer device format that incorporate radical lutetium bis-phthalocyanine and octasubstituted nickel phthalocyanines, as well as their sensing capabilities for vapour. The electrical properties of the, which have hexyl sulfonyl, hexyl sulfonyl, and p-carboxyphenoxy moieties, are electron donating, accepting, and mild accepting, respectively. Cyclic voltammetry has also confirmed these effects. The interfacial electrical conductivity and the kind of organic heterojunction that forms are modulated by the substituents' electronic effects. Assembling accumulation and accumulation/depletion heterojunctions is facilitated by the electron acceptor and donor groups, which are also the hexyl sulfonyl group-based heterojunction device was the most responsive of the examined heterojunction devices in the range of relative humidity and in the range of concentrations. It's interesting to note that the pcarboxyphenoxy-substituted bilayer device had am bipolar behaviour, which means that with higher Rh values, its p-type semiconducting nature changed into an n-type, as seen by the change in its negative reaction into a positive response to. Redox gas sensors are crucial electrical devices for a variety of applications, including the detection of industrial emissions, biological investigations, and air quality monitoring [1].

Traditionally, these sensors were utilised as two-terminal and three-terminal electrical devices, respectively, such resistors and Field-Effects Transistors, in which a semiconducting material is used as a sensing layer. According to the associated transducer, the working principle is based on the modification of charge carrier concentrations electrons e- semiconducting layer upon exposure to the redox gases environment, which is detected as a change in resistance or conductance. Metal oxides including $SnO_2$, $TiO_2$, $MoO_3$, $WO_3$, and $Fe_2O_3$ constitute the basis for the majority of these sensors that have been produced to date. With respect to a variety of redox gases, such as nitrogen dioxide $NO_2$, ammonia $NH_3$, ozone $O_3$, sulphur dioxide $SO_2$ and hydrogen sulphide, these sensors displayed good sensitivity and low detection limits $H_2S$ However, the great performance of metal oxide-based sensors is frequently accompanied by a number of drawbacks, the most notable of which are the high costs associated with the microfabrication technique, poor selectivity, baseline signal drift, and high temperature requirements [2]. Organic semiconductors, which are typically conjugated materials and have generated a lot of interest in the development of gas sensors, hold promise as a suitable substitute.

Metal phthalocyanines, one of the most thoroughly researched molecular semiconductors in the vast collection of these conjugated materials, are distinguished by a macrocyclic structure that is produced by the union of four is indole subunits, creating a cavity that can accommodate various metal atoms [3]. The relationship between materials' structure and thin film properties is so strong that even a small change in the structure, such as swapping out a central metal atom or adding electron-withdrawing or -donating substituents at the periphery can dramatically alter the semiconducting properties. Great vacuum and wet chemical methods can be used to produce thin films made of materials because of their high chemical and thermal stability and solubility in a variety of organic and aqueous solvents. The conductivity of materials, with the exception of those with lengthy saturated substituents, was often high enough to be employed in conduct metric gas sensors.

Which also emphasised the gas sensing process based on the metal centre's Lewis acidity and the gas molecules' binding enthalpies? Using chemiresistors-based sensors, the impact of the central metal atoms and fluorination level in was examined. Between their tetra and per fluorinated derivatives, the with as the core metal and tetra substitution demonstrated the strongest reactivity in the $NH_3$ concentration range. In other places, the thin films' gas sensing capabilities in various devices were assessed. Organizations and structural defects correlation with electrical conductivity, followed by their effects on sensory characteristics. At room temperature, thin films-based gas sensors have extended response/recovery kinetics due to higher chemisorption and diffusion of the gas molecules in the bulk, despite having excellent sensitivity and selectivity towards redox gases. Additionally, thin films have poor organisation, and charge transport primarily occurs by hopping process in discrete energy levels [4]. These processes are frequently hampered by extrinsic traps water and oxygen under prolonged exposure in ambient conditions, resulting in conductivity loss and lengthened response and recovery times, especially for n-type. To get around these restrictions, many strategies have been used, including the use of a micro-heater to enhance desorption, ultrathin sheets to inhibit The application of heterostructure in an appropriate device design, where the related organic heterojunction effects may be taken advantage of to increase conductivity and charge mobility, is another novel strategy.

Because the work function, semiconducting polarity and carrier's concentration of these macrocycles can be altered by the electronic effects of peripheral substituents and to a lesser extent by central metal atoms, materials are a great option for realising organic heterostructures with the desired properties. We previously examined the potential extremely high sensitivity and stability as well as n-type, p-type, and am bipolar behaviour toward in another study of this type Am bipolarity, which is uncommon in gas sensors, is a charge transport regime in which the concentrations close to equilibrium in device conduction channels [5]. Because they can operate in two modes based on bias polarity and multiplex sensing, am bipolar gas sensors have advantages. We showed how substituents' electronic effects may be used to tailor the electrical characteristics of organic heterostructures based on phthalocyanines, which can then be used to create a sensitive and specific ammonia sensor.

## Conflict of Interest

None.

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