Detection of atmospheric pollutants

VNIVERSITAT DE VALÈNCIA

R&D RESULT

Patent

Knowledge Area

- Analytical Chemistry
- Organic Chemistry
- Chemical Instrumentation

Collaboration

- Technology available for licensing
- Other collaborations

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Colorimetric sensor for detecting hydrogen cyanide.

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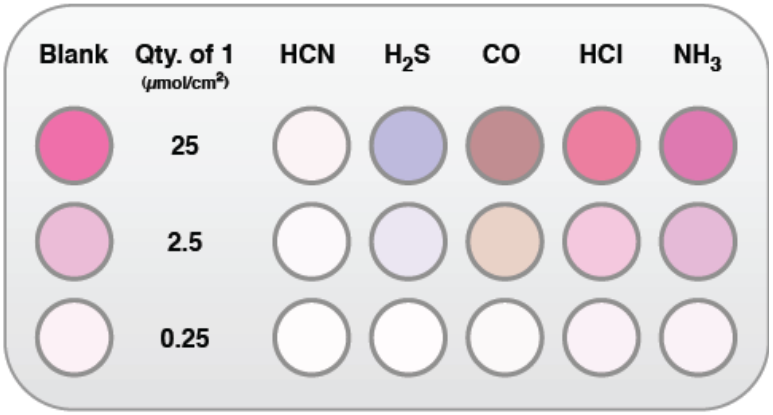
Background: Both cyanide anion in solution (CN^-) and hydrogen cyanide as a gas (HCN) are contaminant molecules, extremely toxic and dangerous in physiological systems as well as in the environment. Currently there are many colorimetric sensors for detection of CN^-, however they generally do not offer adequate selectivity in the presence of other pollutants. Regarding the detection of HCN, colorimetric systems marketed so far use an indirect route for the detection, with a pH indicator which detects the HCl generated by the reaction of HCN with $HgCl_2$. The use of this type of mercury salts generates a significant pollutant load, what makes especially interesting looking for new effective and environmentally friendly alternatives.

The invention: Researchers at the University of Valencia have designed **new colorimetric sensors for CN^- and HCN**, which have excellent selectivity and detection limits within the commonly accepted security ranges. For both applications, the invention is based on the use of a diphenylmethane-quinone compound. For the specific case of HCN gas, the compound is deposited on a solid support of basic nature.
The correct choice of the compound has allowed obtaining a carbon center with electrophilicity suitable for the cyanide anion. This compound, unlike other similar commercial molecules, maintains its characteristics and reactivity once deposited on a suitable solid support. Thus, researchers have designed the first colorimetric sensor for gaseous HCN, with direct reaction.

Applications: The invention is applicable to the fabrication of sensing devices, especially as personal protection systems. These systems are useful in **various industrial sectors** that generate HCN (wood, plastic, steel, jewelry, mining, petrochemical, etc.) as well as in **public buildings** susceptible to attacks (stations, airports, etc.)

Advantages: The main advantages provided by the invention are:

- **Detection Limits:** The direct reaction between the sensor and the HCN leads to a marked color change with detection limits below 1 ppm.
- **Selectivity**: in the presence of other gases such as CO, HCl, NH_3, H_2S, at concentrations up to 50 ppm
- **Environmentally friendly**: no heavy metals used.
- **Reversibility**: The reaction is reversible by irradiation with UV light so it can be reused in successive cycles
- **Minimizing false positives**: Regeneration by UV radiation occurs only if the sensor reacted with HCN.



Color differences for 3 sensors with different concentrations of diphenylmethane-quinone compound, with samples of HCN, H_2S, CO, HCl and NH_3.

OTRI oficina de transferència de resultats d'investigació

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