LEONARDO

PATENT BROCHURE

METHOD TO CONTROL THE TIME RESPONSE OF A CHEMICAL SENSOR

Main Technological Area e ⟶ Pollutant Gas Detection / Sensoring

Keyword ⟶ Chemical Sensor | Carbon Nanotubes |Impedence | nitrogen dioxid |Absorption

A chemical sensor identifies the target substances, especially gases, through the changes in chemical-physical properties (expecially the impedance) produced exposing its contacts to these substances. The semiconductors and/or layers of nanotubes (particularly carbon or CNT) show:

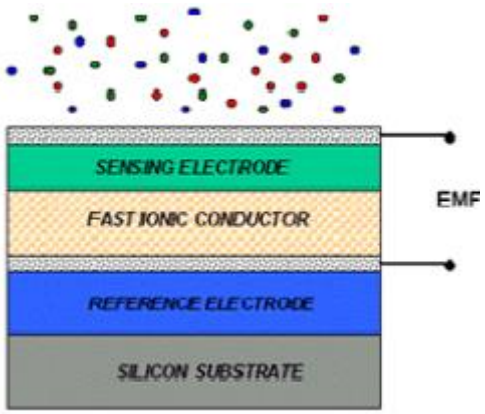
- high sensitivity;
- low dependence of sensitivity on temperature;
- linear response, even for low concentrations (hundreds of parts per million).

However, the recovery times of the sensor are high because the gas molecules, whose presence is to be detected, remain adherent for a long time to the walls of the carbon nano-tubes, or active material of the sensor. It must be considered that the recovery time is generally in the order of many tens of minutes. A very effective technique to reduce the desorption time of molecules from the sensor, is to radiate the active area with ultraviolet light. This technique is regarded as commercially poorly applicable because it is very expensive and complex at the same time; moreover, it cannot be used in the case of a large number of sensors permanently located in places with poor access in the area to be monitored (tunnels, pipelines, service rooms and similar).

Using the patented solution it is possible to obtain a low desorption time (and therefore to restart the sensor) through the use of an electrical signal, thus drastically reducing the detection and recovery cycle times, maintaining the characteristics of high sensitivity of the sensor and a low dependence of sensitivity on temperature.

The sensor has been studied and developed to detect nitrogen dioxide or ammonia (NO2, NH3) but it can be used for any other gas depending on the active substance used. In addition, applying a modulated electrical signal it is possible to detect the composition of the gas mixture to which the sensor is subjected by comparison with known response parameters from laboratory tests.

The active material may also consist of organic semiconductor materials and organic-metallic materials. deposited between pins



TECNICAL FEATURES

Silicon or Silicon dioxide device; active area in Carbon Nano Tube (CNT), Nano Carbon Composite, Nano Diamond, Metal Oxides, Organic Semiconductors; Sensitivity to NO2, NH3, Other; Absorption Gate Voltage; and desorption: -20V ÷ +20V; operating frequency: DC ÷ 100KHz; frequency analysis: ≥ 100KHz; range of temperature between 23°C and 80°C with sensitivity variation between 6% or 7%

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INNOVATION/BENEFITS/

Benefits:

- low desorption time of the target substances from the active area;
- reduced cycle time sensor absorption/desorption;
- sensor control without operator intervention;
- spectrometric analysis of the composition of the gas mixtures.

AREAS OF USE

Survellance	*Sensor networks for the surveillance of both industrial and public environments (subways, railway stations, airports, ...) for security purposes (prevention of contaminants)*
Measurement tools	Measurement benches for laboratories
Industrial processes	Management of sensor reaction times in industrial production processes

PATENT INFORMATION

Priority Date – 2004/12/30
Priority Number - *EP1831681*
IPC Codes – *G01N 27/12 G01N 33/00*

Active Worldwide Extensions
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Italy – Germany – United Kingdom

Leonardo internal code
LDO-0433

Leonardo References
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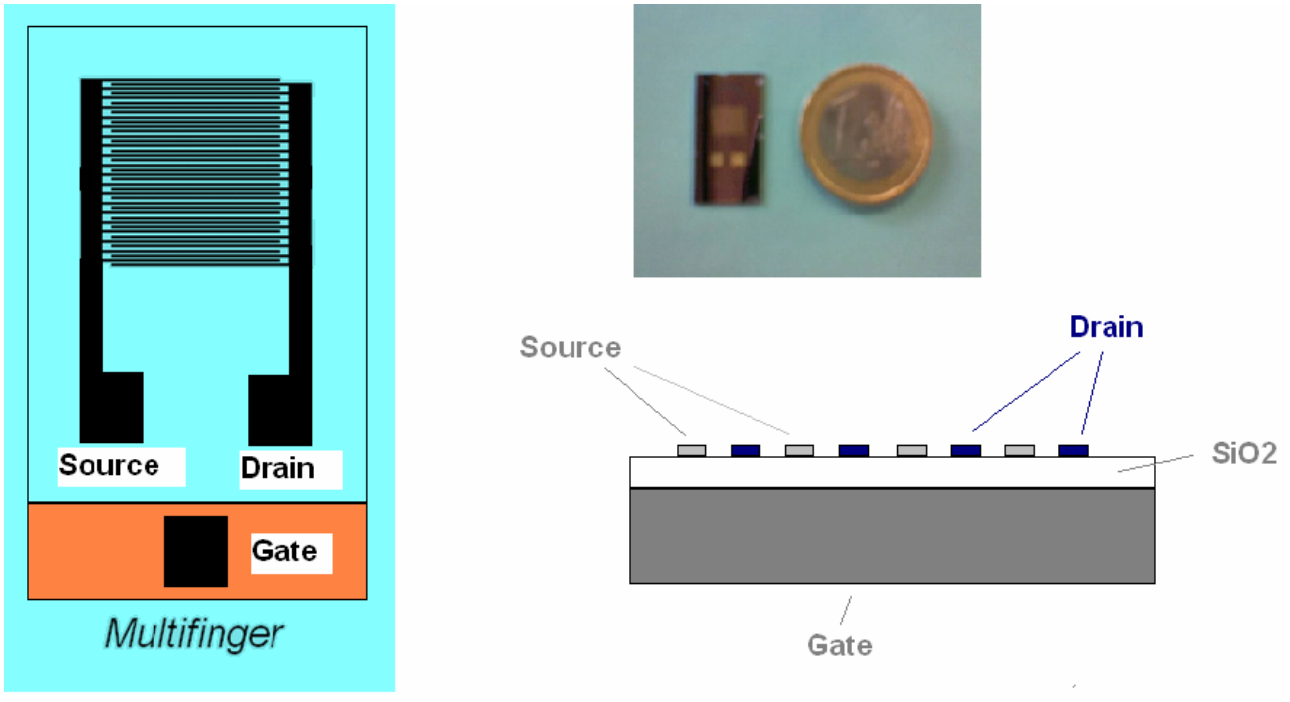

Figure 1. Sistem Overview