

II. DESIGN OF THE GAS SENSOR SYSTEM

Volatile Organic Compounds (VOC) sensors are recently attracting the interest of industry for the increasing number of applications of electronic noses. VOC sensors often employ simple electrical circuits where an integrated heater maintains the sensing element (generally a metal oxide semiconductor layer) within a specific temperature range defined by the manufacturer. The operation of the metal oxide chemical sensors depend on: when oxygen is in the ambient environment reaches a certain level. The amount of oxygen on the sensor surface is constant and it's oxidizing effect results in the removal of electrons from the bulk of the semiconductor. Fig. 1 shows the design of the gas sensor system.

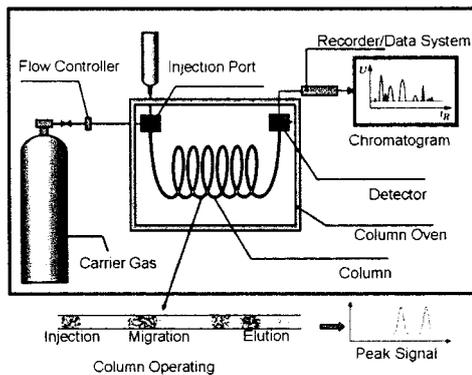
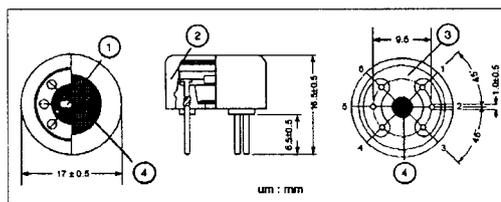


Fig. 1. Gas sensor system (gas chromatography)

III. ELECTRONIC NOSE

Gas sensor, which is used in this experiment, shows the structure in Fig. 2. This gas detection is produced from metal oxide such as SnO₂. When this oxide gets the high temperature, oxygen molecule will stick at surface oxide metal as negative charge. This causes the electrical potential at the surface with the positive change of outer surface. It shows in Fig.3 (a). The oxygen molecule creates the electrical potential between oxide metal which will block the electron flow. This increases the sensor resistance. When the example of gas flows in the gas system, it will reduce the oxygen or deoxidizing from the oxide metal as shown in Fig. 3 (b).



- ① Sensing Element:
SnO₂ is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
- ② Cap:
Nylon 66
- ③ Sensor Base:
Nylon 66
- ④ Flame Arrestor:
100 mesh SUS 316 double gauze

Fig. 2. Gas sensor

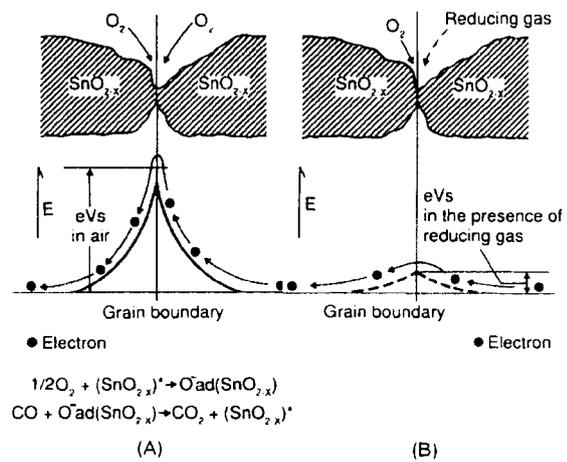


Fig. 3. (a) Model of potential electric surface metal oxide (b) Model of potential electric surface metal oxide during gas measurement

TABLE I: PERCENTAGE OF QUANTITY OF GAS IN NORMAL ENVIRONMENT

Gas	% of quantity	Gas	% of quantity	Gas	% of quantity
N ₂	78.09	CH ₄	0.00015	O ₃	0.000002
O ₂	20.94	Kr	0.0001	NH ₃	0.000002
Ar	0.93	H ₂	0.00005	NO ₂	0.00001
CO ₂	0.032	N ₂ O	0.000025	SO ₂	0.0000002
Ne	0.0018	CO	0.00001		
He	0.00052	Xe	0.000008		

IV. EXPERIMENT AND RESULTS

The electronic nose system is shown in Fig. 3. It consists of 4 sensors. There are solvent vapor (TGS2620), air contaminate (TGS2602), CO (TGS2442) and Halogen (TGS832). Those sensors are selected in order to relate to the volatile organic compounds of industrial.

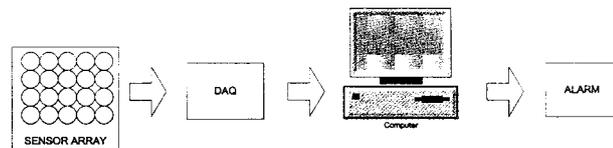


Fig. 4. Electronic nose system of this experiment

In Fig.4 when the gas is flowed in the system, all sensors will response to each compound of gas. The sensitivity of sensor will effect to different compound, this make the different of resistance and flow current. Those resistance and current is converted to digital data and pass through the data acquisition.

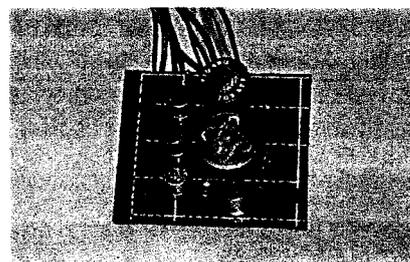


Fig. 5. Sensor array