Introduction to Electrochemical (EC) Gas Sensors

INTRODUCTION

SGX electrochemical sensors detect gases by producing a chemical reaction between the gas and oxygen contained in the sensor. This reaction produces a small current, which is proportional to the concentration of the gas present. The sensor is, in effect, a type of fuel cell.

Reactions occur on two electrodes which when combined together produce the sensing process. These electrodes comprise small discs of porous PTFE onto which is deposited a thin layer of a catalytic metal.

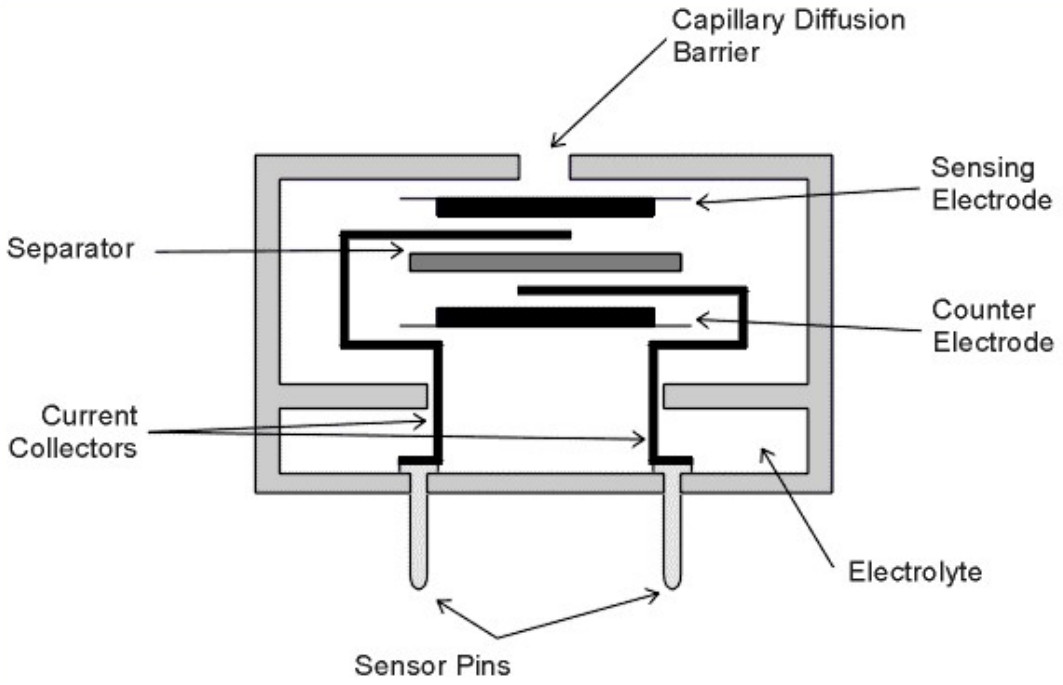
On the working electrode the target gas (carbon monoxide or hydrogen sulfide) react with water to produce either carbon dioxide or sulfuric acid, hydrogen Ions and 2 electrons On the counter electrode, oxygen reacts with hydrogen ions and electrons to form water, e.g.

Working Electrode: $CO + H_2O \rightarrow CO_2 + 2H+ + 2e^-$

Counter Electrode: $½O_2 + 2H+ + 2e^- \rightarrow H_2O$

Overall: $CO + ½O_2 \rightarrow CO_2$

Because the electrodes have a finite catalytic activity (which can change with time and temperature) it is necessary to limit the rate of diffusion of target gas into the sensor (using a barrier) to ensure the gas is efficiently reacted. This barrier takes the form of a small hole or capillary in the sensor housing (see below).



The electrodes need to be kept apart and wetted with an acid electrolyte to allow an ionic current to pass between them. This is done using discs of inert absorbent material or separators. These can be made from materials such as glass fibre.

The electrodes are connected to the external circuitry by thin metal strips or current collectors, attached to pins.