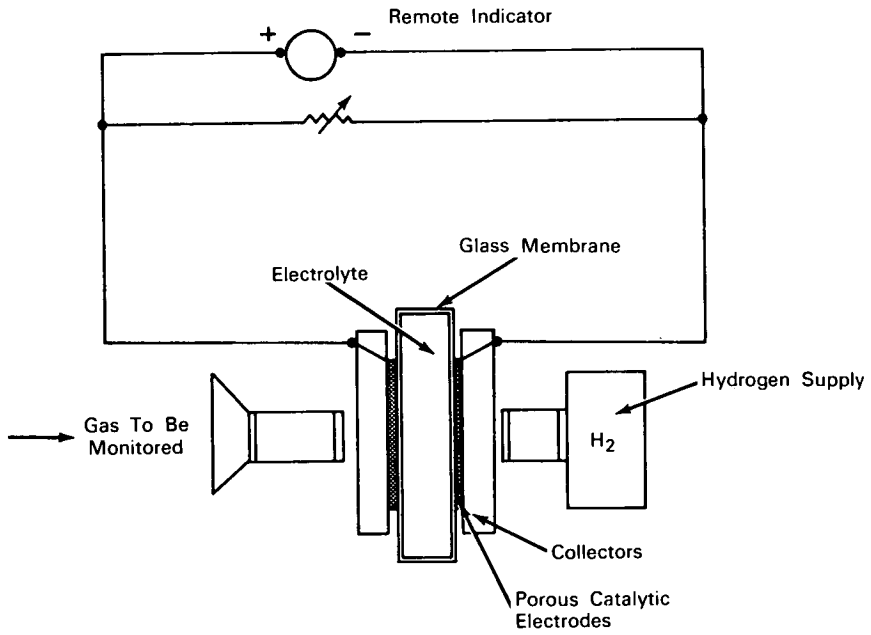
NASA TECH BRIEF

Fuel Cell Serves as Oxygen Level Detector



The problem: Where large quantities of oxygen supplies are stored it is essential to monitor the oxygen level in the air in order to detect any leakage and the rate of leakage. In closed environments such as mines, it is also desirable to monitor the oxygen level in the air in order to ensure a life-sustaining environment. In both instances it is frequently desirable to perform this monitoring from a remote location. Current chemical methods do not readily lend themselves to remote applications.

The solution: A fuel cell that responds to hydrogen and oxygen with an output voltage that is proportional to the partial pressure of these gases encountered. By exposing one electrode to a constant supply of hydrogen and the other electrode to the ambient, the partial pressure of oxygen in the ambient is calculated from the output voltage of the cell.

How it's done: The fuel cell uses sulfuric acid as the electrolyte contained in a round, cylindrical membrane made of a special glass, 0.06-inch thick. Stamped platinum black discs, 1/8-inch in diameter are used as the porous catalytic electrodes. The hydrogen necessary for the operation of the cell is provided from a standard supply source (flask, tank, etc.) while the oxygen is received from the ambient being sampled. The output voltage of the fuel cell is proportional to the amount of oxygen (partial pressure of O_2) in the sampled gas. The relationship between output

(continued overleaf)

voltage and partial pressure of O_2 is not linear but can be calibrated. Test curves show the instrument to be most sensitive at partial pressures of zero to 10 mm Hg and the output voltage to be more linear with pressure from 50 mm Hg up to the O_2 partial pressure equivalent of the earth's atmosphere at sea level. A saturation level was not reached in any test.

Notes:

1. This device could be used as an automatic control wherever oxygen content must be maintained at certain levels in enclosed areas.
2. The detector could serve as a warning device where quantities of oxygen are stored or are transferred by pipe in enclosed passages.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Jet Propulsion Laboratory
   4800 Oak Grove Drive
   Pasadena, California, 91103
   Reference: B65-10066

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: General Electric Company under contract to Jet Propulsion Laboratory (JPL-SC-072)