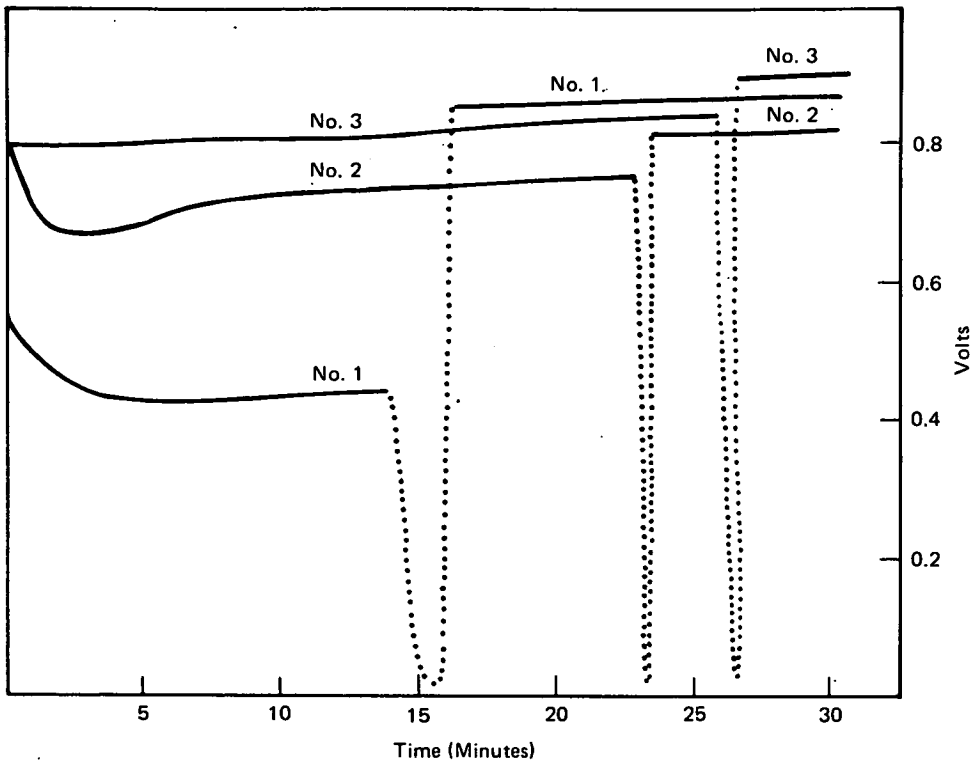
NASA TECH BRIEF

Lewis Research Center

Improved Operation of Rechargeable Oxygen Electrodes



Effect Of Temporary Short-Circuiting On H_2/O_2 Fuel Cells

The operating life and performance of oxygen electrodes in rechargeable metal-oxygen batteries and hydrogen-oxygen fuel cells can be enhanced by incorporating a brief, high-rate discharge pulse in the operating cycle. The pulse rejuvenates oxygen electrode activity by removing a refractory anodic oxygen layer which builds up on the electrodes with repeated cycling.

During an investigation to establish the failure modes of Teflon-bonded platinum black rechargeable oxygen electrodes used in metal-oxygen batteries and hydrogen-oxygen fuel cells, it was found that extended cycling led to accumulation of a refractory anodic oxygen layer which apparently inhibited oxygen reduction. It has been shown that this inhibiting layer can be removed by cathodic reduction, thereby restoring oxygen electrode activity. Tests made on laboratory hydrogen-oxygen fuel cells operating in the rechargeable mode have shown that temporary short-circuiting for periods ranging from three minutes to one second or less restored cell voltages as shown in the figure.

This technology is believed to be readily applicable to operational metal-oxygen batteries and hydrogen-oxygen fuel cells. It is further believed that complete short-circuiting may not be necessary and that oxygen elec-

(continuous overleaf)

trode rejuvenation may be accomplished by a brief, high-rate discharge; however, this has not been explored.

Notes:

1. Although this technology appears to be specific to rechargeable oxygen electrodes, rejuvenation of other fuel cell electrodes by pulsing seems possible as a means of increasing life and performance.
2. No detailed technical documentation is available. Specific questions, however, may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B72-10479
3. A report of the research project during which this technology was established may be obtained from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)

   Reference: NASA CR-72999 (N72-10051), Research on Rechargeable Oxygen Electrodes

Patent status:

No patent action is contemplated by NASA.

Source: Paul A. Malachesky and
Gerhard L. Holleck of
Tyco Corporate Technology Center
under contract to
Lewis Research Center
(LEW-11619)