

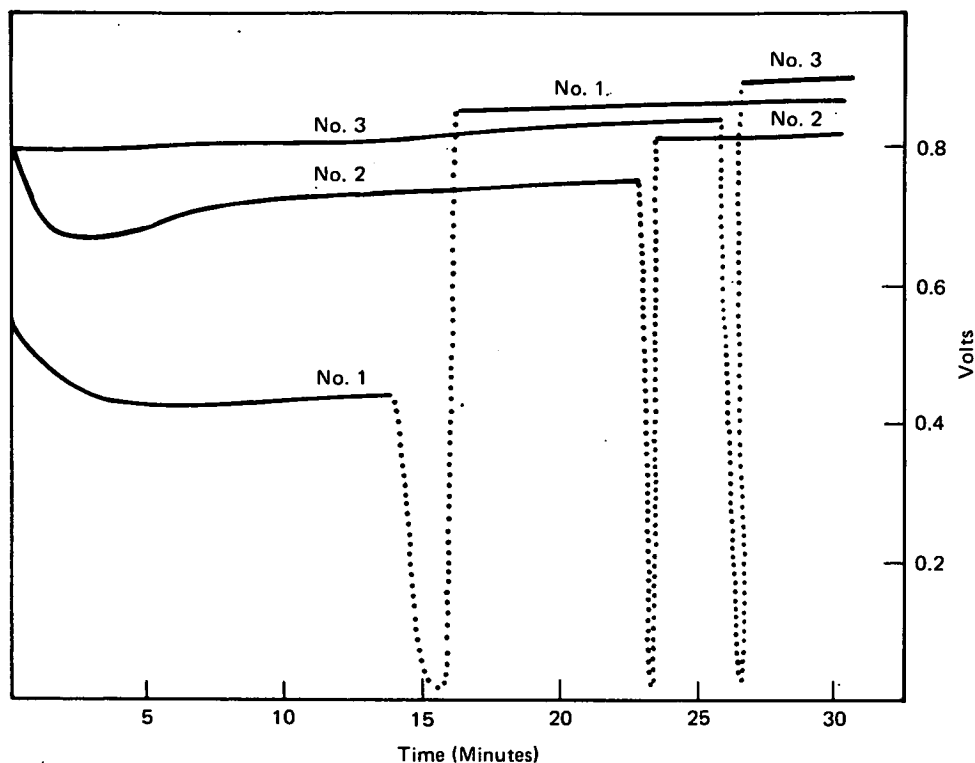
# NASA TECH BRIEF

## Lewis Research Center



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### 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  
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