SYNTHESIS AND CHARACTERIZATION OF IMPROVED ION SELECTIVE SEMIPERMEABLE ANION EXCHANGE MEMBRANES

Ionics, Inc., 65 Grove Street, Watertown, MA 02172 (U.S.A.)

The objective of this contract is the manufacture and evaluation of improved anion selective membranes suitable for use in the electrochemical Redox Energy Storage System.

Of the membrane systems investigated, the two most suitable are the CD1L and CP4L systems. These membranes are easy to manufacture in large quantities and the cost is low. More research is presently being done on lowering membrane resistivity by slightly varying some of the chemical components. The long range goals are to reduce resistivity and still maintain good selectivity and durability. Also, a low level search will continue for improved membrane systems.

The current best membranes have area resistivities of 3 ohm cm^2 when measured in 2N HCl and 5 ohm cm^2 when measured in redox cells.

Recent publications

1 S. S. Alexander and R. B. Hodgdon, Anion permselective membrane, *Ionics, Incorporated, NASA Contract Rep. No. CR-135316, January, 1978.*

ADVANCED SCREENING OF REDOX ELECTROCATALYSTS AND ELECTROLYTE MODIFICATIONS

Giner, Inc., 14 Spring Street, Waltham, MA 02154 (U.S.A.)

Task I — Characterization and improvement of the gold–lead electrodes including optimizing operating conditions such as current density, potential cut-off, etc. Further optimization of the gold–lead electrode will emphasize co-deposition of intermetallic phases and activation of the carbon or graphite felt substrate. Cycle life testing of a number of promising candidate preparations including carbon and/or graphite substrates will be done.

Task II — Investigation of catalysts other than gold–lead mixtures for reversibility of the Cr^{3+}/Cr^{2+} reaction, hydrogen overvoltage and corrosion

stability. Such catalysts will include zirconium carbide, cadmium, bismuth, titanium, indium and mercury.

Task III — Investigation of electrolyte modifications (as compared with the standard electrolyte 2N HCl, 1M $CrCl_x$ solution), aimed at (a) the use of less expensive chromium solutions, (b) the tolerance of the redox cell to crossover through the ion exchange membrane, and (c) the effects of various impurities that might be expected in inexpensive forms of chromium chloride.

COST PROJECTIONS FOR REDOX ENERGY STORAGE SYSTEMS

United Technologies Corporation, Power Systems Division, P.O. Box 109, South Windsor, CT 06074 (U.S.A.)

The objective of this contract is to estimate the cost of redox system hardware based on the extensive company experience in estimating costs of electrochemical systems for various applications including fuel cell systems and components.

ENERGY SAVINGS BY MEANS OF FUEL CELL ELECTRODES IN ELECTROCHEMICAL INDUSTRIES

Prototech Company, 70 Jaconnet Street, Newton Highlands, MA 02161 (U.S.A.)

The objectives of this contract are: (1) to evaluate experimentally, on a laboratory scale, energy and cost savings in electrowinning of zinc by substituting, for the conventional lead anode, a Prototech proprietary hydrogen anode; (2) similarly to evaluate experimentally, again on a laboratory scale, voltage, and thus energy savings in chlor–alkali membrane cells by substituting, for the conventional steel cathods, a Prototech proprietary air cathode; (3) to consult with Lockheed and Lawrence Livermore Laboratory (LLL) on the subject of suitable air electrodes for metal/water/air batteries.

Prototech's air cathodes have been tested by Ionics, Inc. of Watertown, Massachusetts. A joint program is under discussion with Ionics; it is intended to scale-up the air electrodes and to demonstrate their performance in an