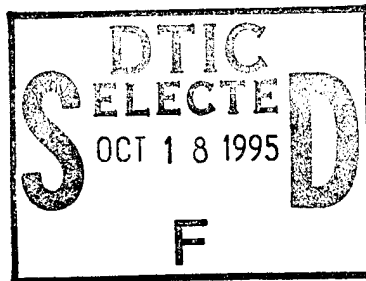


DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE
LITHIUM-ION BATTERY



Contract # N00014-94-C-0141
ARPA Order # 9332004arp01/13 APR 1994/313ES

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Distribution Unlimited

R & D Status Report #4

Reporting Period: 16 January - 15 February, 1995

Submitted by:

The Electrofuel Manufacturing Company Inc.

DTIC QUALITY INSPECTED 8

DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE LITHIUM-ION BATTERY

R&D STATUS REPORT
1931-1004/0

ARPA Order No.: 9332004arp01/13APR1994/313ES
 Program Code No.: ARPA-BAA93-32
 Contractor: The Electrofuel Manufacturing Company Inc.
 Contract No.: N00014-94-C-0141 Contract Amount: \$1271728.
 Effective Date of Contract: August 15, 1994
 Expiration Date of Contract: February 14, 1996
 Principal Investigator: J.K. Jacobs
 Telephone No.: (800) 388-2865
 Short Title of Work: Lithium-ion Battery Development
 Reporting Period: January 16, 1995 to February 15, 1995

Description of Progress:

The work during this period progressed well. An engineering cell modelling was completed, which suggested that an optimum cell composition would be 760 microns (0.030") thick. Of this the cathode would be 200 microns thick (26%), anode 450 microns thick (60%), separator including electrolyte 60 microns and 50 microns being the current collector. Such a cell would have an energy density of about 120 wh/kgm and about 260 wh/litre.

As part of the deliverables, 20 coin cells were produced and delivered to ARPA. These were button cells (2520), and the hardware were produced inhouse through stamping of steel, the electrodes were pressed and the cells were processed for the formation cycle.

A charging circuit was designed, which utilizes a pulse charging along with sensing of open circuit voltage. This could provide excellent control of the battery.

A review meeting was held at ARPA, to review the progress.

The construction of the prototype pilot line has started, including the fabrication of the prototype web handling equipment.

The orthorhombic lithiated manganese oxide was produced in batches of 5 kilograms. The material is being incorporated into button cells for lifecycle testing. X-ray diffraction shows that the material is not the spinel form, but is the orthorhombic form

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of manganese oxide. In terms of the lithium ion battery, this material has about 30% higher capacity than the spinel form. The X-rays show two small extra peaks, which were not observed in the earlier production of small batches (gram quantity production). Perhaps this could be due to an ingress of water during the scale up in the vacuum furnace.

Change in Key Personnel: None

Summary of Substantive Information Derived from Special Events:
None:

Problems Encountered and/or Anticipated: None

Action Required by the Government: None

Fiscal Status:

	Total Est- imate of Program	US Govt Funding Obliga- tion	Electro fuel Contri- bution
(1) Amt. currently provided on contract:	\$1630421	\$1271728	\$358693
(2) Expenses & commitments to date:	\$ 317665	\$ 247779	\$ 69886
(3) Funds required to complete work:	\$1312756	\$1023949	\$288807

Figure 4: Gantt Chart

