

- (1) DEVELOPMENT OF MANUFACTURING TECHNIQUES FOR LITHIUM-ALUMINUM/IRON SULFIDE CELLS
- (2) DESIGN, DEVELOPMENT AND FABRICATION OF A 40 kW h LITHIUM/METAL SULFIDE VEHICLE BATTERY
- (3) DESIGN AND COST STUDY FOR THE MARK II LITHIUM ALLOY/IRON SULFIDE ELECTRIC VEHICLE BATTERY

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During 1975 to 1979 techniques were developed for the fabrication of cells and Li-Al/FeS-Cu<sub>2</sub>S and Li-Al/FeS<sub>2</sub>-CoS<sub>2</sub> bicells were built with many design variations (*e.g.*, electrode thickness, electrode loadings, and current-collector designs). Five Li-Al/FeS-Cu<sub>2</sub>S bicells were cycled and all but one operated for 500 - 1200 cycles. The Li-Al/FeS<sub>2</sub>-CoS<sub>2</sub> cells had a shorter life of about 250 cycles, but achieved specific energies up to about 100 W h/kg.

In 1978 and 1979 the objective was the development, design, and fabrication of a 40 kW h electric-vehicle battery using Li-Al/FeS-Cu<sub>2</sub>S cells. Multiplate cells having a specific energy greater than 100 W h/kg at the 4 h rate were developed. During the program, a five-cell (6 V) module was fabricated and tested. The 40 kW h Mark IA battery, consisting of two 20 kW h modules in vacuum insulated cases, was fabricated and delivered to ANL. During initial testing, one of the modules failed due to internal short circuit.

In addition a design and cost study was performed on a Mark II battery with the objective of evaluating materials and fabrication methods that would be low cost in mass production. A design was developed for an electric-vehicle battery, and costs were estimated for production rates of 250 and 2000 MW h/yr.

### Recent publications

- 1 R. Hudson and K. Gentry, The design, development, and fabrication of 40 kWh lithium aluminum/iron sulfide electric vehicle battery, *Extended Abstracts Electrochem. Soc. Meeting, Pittsburgh, PA, Oct. 15 - 20, 1978, Vol. 78-2, (1978) p. 242.*
- 2 Eagle-Picher Industries, Inc., Design and cost study — Mark II lithium alloy/iron sulfide electric vehicle battery, *Final Report Contract 31-109-38-4626, December 1978.*