

## ADVANCES IN AMBIENT TEMPERATURE SECONDARY LITHIUM CELLS

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JPL is involved in a R & D program sponsored by NASA/OAST on the development of ambient temperature secondary lithium cells for future space applications. Some of the projected applications are planetary spacecraft, planetary rovers, and astronaut equipment. The main objective of the program is to develop secondary lithium cells with greater than 100 Wh/kg specific energy while delivering 1000 cycles at 50% DOD. To realize these ambitious goals, the work was initially focused on several important basic issues related to the cell chemistry, selection of cathode materials and electrolytes, and component development. We have examined the performance potential of Li-TiS<sub>2</sub>, Li-MoS<sub>3</sub>, Li-V<sub>6</sub>O<sub>13</sub> and Li-NbSe<sub>3</sub> electrochemical systems. Among these four, the Li-TiS<sub>2</sub> system was found to be the most promising system in terms of realizable specific energy and cycle life. Some of the major advancements made so far in the development of Li-TiS<sub>2</sub> cells are in the areas of cathode processing technology, mixed solvent electrolytes, and cell assembly. Methods were developed for the fabrication of large size high performance TiS<sub>2</sub> cathodes. Among the various electrolytes examined, 1.5M LiAsF<sub>6</sub>/EC + 2-MeTHF mixed solvent electrolyte was found to be more stable towards lithium. Experimental cells activated with this electrolyte exhibited more than 300 cycles at 100% DOD. Work is in progress in other areas such as selection of lithium alloys as candidate anode materials, optimization of cell design, and development of 5 Ah cells. This paper summarizes the advances made at JPL on the development of secondary lithium cells.