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Strategic Overview of Silver-Zinc Rechargeable Batteries

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At the heart of the $55 billion global battery market is the chemical conundrum of power supply. Today's consumer has the ability to watch an entire movie on a palm-sized device-but portable power technology has not kept up. Engineers admit that they are "hitting the wall" on lithium polymer and lithium-ion performance. Unstable lithium-ion batteries have resulted in a number of high product recalls by manufacturers of notebook computers. These market trends are creating a pressing need for a better battery.

This improved battery chemistry can now be found in silver-zinc (AgZn) rechargeable battery technology. Silver-zinc battery chemistry has a long, successful history of use by the military, international space programs and by underwater marine applications. The chemistry is currently poised to move into the commercial marketplace for use in consumer electronics.

This new silver-zinc battery chemistry uses the latest in advanced polymers, nano-technology, power electronics and processing methods to create a battery that surpasses other rechargeable batteries for notebook computers, mobile phone and consumer electronics applications.

The advantages of silver zinc batteries can be summed up overall as follows:

High Performance - Up to 40 percent more run time than traditional lithium-ion batteries. And with recent improvements in battery cycle life, silver zinc batteries achieve 200+ cycles at 100 percent discharge to 80 percent of rated capacity and thousands of cycles at intermediate discharge.

Clean Technology - More than 95 percent of key battery elements can be recycled and reused. The raw materials recovered in the recycling process of silver-zinc batteries are the same quality as those that went into the creation of the battery. Environmental impact is lessened since the need to mine for new materials is minimized. Also, there will be financial incentives for consumers to recycle their silver-zinc batteries.

Safe - Silver zinc batteries contain no lithium and are inherently safe. They are not subject to the recent FAA air travel restrictions now placed on lithium-ion batteries. Silver zinc batteries feature a water-based chemistry that is not flammable. The battery is therefore free from the problems of thermal runaway and fire.

To provide further insight on just how "clean" silver zinc batteries are when compared with lithium-ion technology, the difference is dramatic. The primary materials of silver zinc batteries (i.e. silver and zinc) are fully recyclable. That means that the materials derived from recycling process are of the same quality as the materials that went into the initial creation of the battery. Recycling the raw materials results in using a fraction of the energy required to mine for new materials.

In contrast, most elements of traditional lithium-ion batteries are downcycled and cannot be reused. The downcycling process reduces the original battery into raw materials of lower quality which can't be reused for battery production (cobalt is the notable exception). Additional lithium must be obtained before another battery can be produced.

The silver recycling process already exists. Refiners perfected the processes over centuries for jewelry, tableware, photographic film and electronics. Additionally, silver obtained from scrap makes up over 30 percent of the silver that is needed each year to satisfy world demand.

The success of silver zinc technology can be found in three important areas:

Composite Polymer Zinc (Zn) Anode - The zinc anode in silver batter zinc batteries is a composite polymer electrode which inhibits shape change and dendrite growth. In the past, shape change and dendrite growth in traditional silver-zinc cells frequently shortened the overall cycle life of the battery.

Multi-Functional, Layered Separator - A separator stack within the silver zinc battery resists dendrite growth from the zinc anode, while simultaneously resisting degradation from the silver cathode. At the same time, it allows ions to move freely from the cathode to the anode to minimize the cell's internal resistance. This results in a superior silver-zinc battery cell which offers long life.

Nano-Particle Silver Oxide (AgO) Cathode - The silver oxide cathode in silver-zinc rechargeable batteries is coated with nano particles. This nano-technology enhances conductivity for lower internal resistance and faster charge times than traditional silver zinc batteries.

Silver zinc has significantly higher volumetric energy density than existing battery technologies such as lithium-ion or nickel cadmium, nickel metal hydride, or lead acid. It has 40 percent more energy density than traditional lithium-ion batteries and

offers plenty of runway to safely increase energy density and cycle life.

The batteries have passed a wide range of tests, including environmental high-performance tests (heating, temperature cycling, storage); electrical performance tests (short circuit, abnormal charge, forced discharge); mechanical performance tests (impact, crush, test, nail penetration).

At the present time in the development of silver-zinc rechargeable battery chemistry, there are no serious obstacles to bringing the technology into the market. Many of the fundamental chemical and technology challenges that were experienced in the earlier phases have been overcome. Right now, the focus is on scaling manufacturing processes to meet high anticipated demand. The current work is focused on achieving and maintaining world class quality.

A silver zinc battery option will be rolled out in a major notebook computer in early 2009. The battery is slated to be released as a premium extended life battery. The notebook will be "dual chemistry enabled" which means it will work with either silver-zinc or lithium ion batteries.

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