via mechanical alloying and thermal treatments. Monophased Zr-based alloys containing substantial amounts of magnesium were obtained. A planetary ball mill was used and different milling times and rotational speeds of the discs and vials were considered. Different heat treatments were also studied The alloys were characterized by XRD, EPMA, SEM and TEM. A special effort was given to the TEM analysis, as the alloys obtained were nanocrystalline. It was observed that the alloys were actually grains of micron sizes made up of agglomerated nanocrystallites. Hydrogen absorption isothermal curves and kinetics were measured at different temperatures. Electrochemical measurements were also performed. The properties were then related to the structural and morphological observations. It was shown that nanocrystallinity could enhance the activation rate of the alloys as well as their absorption kinetics. However, the introduction of magnesium into these alloys did not improve their mass capacities.

* Corresponding author.

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Advanced nickel/zinc batteries for consumer and mobile applications

Allen Charkey * and Dwaine Coates

Energy Research Corporation, Danbury, CT 06813 U.S.A.

This poster discusses rechargeable nickel/zinc battery development for both small size consumer cells and mobile applications such as electric bicycles, electric scooters and hybrid and electric vehicles. Nickel/zinc battery performance has been improved through the development of a reduced solubility zinc electrode and a patented sealed cell design. Deep cycle capability has been increased to 700 cycles while maintaining a high specific energy up to 70 W h kg^{-1}. Battery cost has been reduced through the use of patented plastic-bonded nickel and zinc electrodes. Cycle life performance has been improved by the use of a reduced solubility zinc electrode and a unique patented sealed cell design. The nickel/zinc battery represents the next technological plateau to replace lead-acid batteries for many applications. Nickel/zinc can also replace environmentally unacceptable nickel/cadmium and costly nickel/metal hydride batteries with a safer, more energetic and less expensive system. This patented nickel/zinc technology is currently being licensed to several commercial entities for a variety of applications.

The nickel/zinc system is ideal for mobile applications such as electric bicycles and scooters, electric and hybrid vehicles. The nickel/zinc battery, with a specific energy greater than 60 W h kg^{-1}, is capable of providing a vehicle range of 200 km total energy cost of 3 to 4 cents/km for a 25 kW h battery that would cost about US$4000.00 in large-volume production. Other battery systems currently under development for electric vehicles are focused on technologies that are either too expensive, too heavy or contain environmentally undesirable materials. The nickel/zinc battery will provide electric vehicles with sufficient range and economy to satisfy most vehicle requirements. Several demonstration electric vehicles have been tested with 12 kW h batteries and additional programmes are currently underway.

* Corresponding author

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