Avery Park
Aap2190
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Blog Post

A review of: Rechargeable Nickel Telluride / Aluminum Batteries with High Capacity and Enhanced Cycling Performance

By: Zhijing Yu, Shuqiang Jiao*, Jiguo Tu, Yiwa Luo, Wei-Li Song*, Handong Jiao, Mingyong Wang, Haosen Chen*, Daining Fang

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With the growing popularity in alternative energies, such as solar and wind, efficient ways to store this energy is a necessary point of research before a widespread change can truly be implemented. Storing this energy comes in many ways. People are researching creating solar-to-hydrogen fuels, such as we studied in the lab, as well as making other types of batteries.

Yu *et al.* researches the potential of creating a longer lasting, more efficient, and overall better battery using aluminum with metallic nickel telluride. Lithium-ion batteries (LIBs) are the most common battery currently because of their high efficiency and high energy density. However, their high cost of non-abundant material and various safety issues are causing many scientists to rethink their popularity and search for other options. One promising up-and-coming battery material is Aluminum. Aluminum-ion batteries (AIBs), like LIBs, have the potential of high energy density. AIBs become more promising when the safety and earth abundant material of the battery is considered, where they greatly outrank the LIBs. Keeping these batteries from competing with LIBs on the large scale is their short life span and poor reversibility.

Yu *et al.* first show the synthesis of the nickel telluride. The structures synthesized were as expected from previous literature. The use of this nickel telluride had first been explored in 2014 by Sun *et al.* and thus the synthesis does not seem to be a novel aspect of the xperiment nor require such length and detail (1). Confirmation of the structure would suffice. The researchers then show that the telluride and nickel have good reversibility because the Te was reduced to NiTe at the end of discharge. These results would be best if put in context of LIBs. Should this goal of this research be to replace LIBs with AIBs, it is important to see how any improvements in the AIBs compare to LIBs natural characteristics. Similarly, the researchers show that the batter has a better lifespan than other AIBs through repetitive charging and discharging. Over 400 cycles, after a decay in the first 50, the charge and discharge capacity stayed relatively constant. Researchers say that the initial decay could have been due to the dissolution of soluble products. However, they do not defend this statement. Future experiments could be conducted to determine why the initial decay and confirm the dissolution of which products. After this is better determined, improving the lifespan further may be possible.

Because this research was done with the hopes of introducing a new battery that could rival and surpass the popularity and need of LIBs, it would be helpful to see the results of this research compared to results of regular LIBs to show either improved characteristics or better define areas of possible improvement. A clear comparison would also better state the commercialization feasibility. AIBs show better characteristics in terms of safety and material, but how much better must these characteristics be to offset the lower life span and reversibility?

Citation

1. Haobo Sun, Wei Wang, Zhijing Yu, Yan Yuan, Shuai Wang, Shugiang Jiao. “A new aluminium-ion battery with high voltage, high safety and low cost” https://pubs.rsc.org/en/content/articlelanding/2015/CC/C5CC00542F#!divAbstract