Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M17-190P^
Published: 2/26/2020

Inventors

Leigang Xue

C. Austen Angell

Contact

Shen Yan
shen.yan@skysonginnovations.com

Cathodic Aluminum Batteries for Grid-Scale Energy Storage Solutions

Background

Grid energy storage, at its essence, allows electrical energy to be stored when production exceeds consumption and released when consumption exceeds production. Grid energy storage improves the robustness and resilience of conventional electrical grids and can supplement intermittent energy sources such as solar, wind, or tidal. In particular, molten-salt batteries are promising candidates for grid energy storage. Named for their utilization of a molten salt electrolyte, molten-salt batteries are energetically dense but very safe. Furthermore, molten-salt batteries can be efficiently charged and discharged for many cycles before requiring replacement. However, to make grid energy storage a reality, a system that is low cost yet has a high energy density is needed.

Invention Description

Researchers at ASU have developed a Cathodic Aluminum Battery (CAB) using molten-salt electrolytes that can serve as an effective grid scale energy storage solution. The CAB turns typical aluminum battery convention upside down by using aluminum as the cathodic material as opposed to serving as the anode. The construction of the CAB is straightforward, utilizes readily available, and earth abundant electrolytes. The specialized blend of electrolytes allows the CAB to undergo many charge/ discharge cycles. Further, should the cell performance drop below acceptable levels, depleted electrolyte solutions may be supplemented to restore the CAB to its original function. Excitingly, although the CAB is composed of earth-abundant materials, the energy density is comparable with other grid-scale batteries.

Potential Applications

- Grid-Scale Energy Storage
- Emergency Power Supply

Benefits and Advantages

- Better Bang for Your Buck – The Na-Al battery is made from inexpensive, earth abundant materials yet has equivalent energy density to that of Li-ion

batteries at significantly reduced cost.

- Replenishable – The battery design makes it possible to replenish the electrolyte material. Competing Li-ion or Na-Ni batteries often require replacement over a similar time period, resulting in

  increased cost and waste.

- Safe – The nature of Na-Al battery chemistry makes it inherently safe. If any of the components fail the result will be the formation of a harmless salt.

Professor Austen Angell's Directory Webpage