

CAST THERMAL BATTERY COMPONENTS USING A SALT BINDER

US Patent 10,727,474

SD# 14159

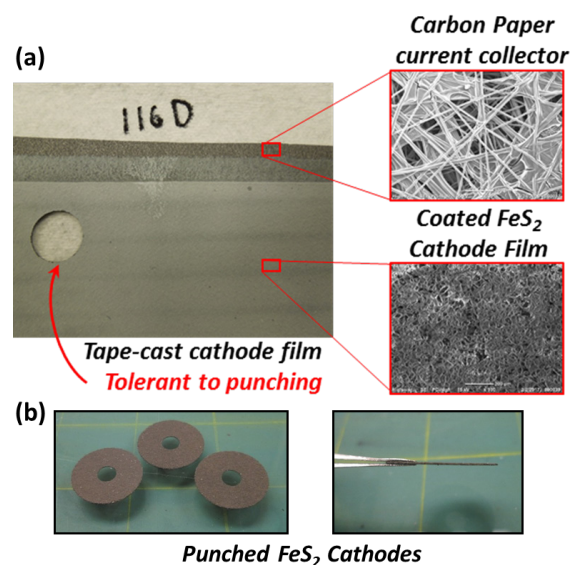
Technology Readiness Level: 4

Combined components have been demonstrated in laboratory scale single-cell tests under relevant thermal and electrochemical loads. Separate components have been demonstrated in full thermal battery prototypes.

A rapid, flexible, and low-cost method of producing thermal battery components using thick film advanced manufacturing techniques to achieve greater uniformity and consistency

Thermal batteries, also known as molten salt batteries, are useful for powering applications that require high power density, a long shelf life, and little to no lifetime maintenance. Currently, thermal batteries are fabricated by forming solid pellets through the high-pressure processing of materials. This is not only labor-intensive, expensive, and time-consuming, but also restricts thermal batteries to a single, cylindrical shape.

Sandia researchers developed a novel method for fabricating cast thermal battery components, including cathodes and separators, using thick film advanced manufacturing techniques. This technique replaces the pellet electrode process with a casting process that uses a conductive salt binder and/or its constituent salts. Casting involves applying standard thermal battery materials in a film laydown process supported by roll-to-roll processing, tape-casting, and other forms of printing which enable prismatic, spiral wound, stacked, or z-fold shapes. The result is a rapid, flexible, and low-cost method of producing thermal battery components with greater uniformity and consistency over currently available pellet processing.



Shown: A) As-cast FeS₂ cathode film on carbon paper B) Individually punched cathodes from cast films

TECHNICAL BENEFITS

- Improved consistency and uniformity
- Reduced production time
- Reduced cost- up to a 30% reduction in production costs
- Thinner cathode and separator films (~0.008") support smaller overall battery designs
- Compatible with additive manufacturing, tape-casting, roll-to-roll coating, and gravure printing
- Enables non-cylindrical shaped components

INDUSTRIES & APPLICATIONS

- Extreme Environments
- Electric vehicles
- Launch vehicles
- Marine