Boric Acid in Energy Storage Systems for Energy Transition

Electroanalysis determines the analyte concentration in a sample. As boron can oxidize other substances in solution, an excellent candidate for electroanalysis.


Boric Acid in Energy Storage Systems

NEW YORK, NEW YORK, USA, June 13, 2022 /EINPresswire.com/ -- Energy storage is a key piece of the puzzle in easing energy transition, and a new system developed by scientists at TU Wien (Vienna) using boric acid can store a large amount of energy in an eco-friendly way. What role does boric acid play in the energy transition?

Energy Storage

The energy sector is transforming as the increased penetration of renewable energy sources, such as wind and solar, is driving the need for energy storage solutions that can help balance the grid. Energy storage can provide many benefits to energy storage systems, including improved system efficiency and reliability and reduced greenhouse gas emissions.

There are various energy storage technologies available, each with its advantages and disadvantages. Technologies include mechanical systems (such as flywheels and compressed air energy storage), thermal energy storage (such as molten salt and ice storage), chemical energy storage (such as batteries and hydrogen fuel cells), and electrical energy storage (such as capacitors and superconducting magnetic energy storage).

The most suitable technology for a particular application will depend on many factors, including the energy density (energy stored per unit volume), the energy efficiency (energy percentage converted from one form to another), the power density (the rate at which energy takes conversion), and the cost.

Scientists at TU Wien (Vienna) used the principle of conversion of thermal energy into chemical energy and vice-versa. They have developed a chemical heat storage system to store high

amounts of energy in an environmentally friendly manner for an almost infinite period.

Heat is used to initiate the chemical reaction, which results in energy-dense chemical compounds that can be stored for months with zero energy loss. The chemical reaction could then be reversed to release the energy, also known as thermochemical heat storage. In this manner, excess heat from industrial sites or solar heat can be retained and used.

Thermochemical Heat Storage

Thermochemical heat storage works by reversibly changing the state of a chemical compound to store or release heat. For example, when water is heated, it undergoes a change of state from liquid to vapor. This process absorbs a large amount of heat energy, which can be rereleased when the water vapor is allowed to cool and condense back into liquid water.

Thermochemical energy storage is a promising technology for several reasons.

High energy density means that a relatively small amount of material can store a large amount of energy.
Stores energy at high temperatures, well suited for applications such as solar thermal power plants.
Zero heat losses make it efficient for long-term storage.

Boric Acid As A Thermochemical Energy Storage Material

Using boric acid as a chemical energy storage material could provide an efficient and environmentally friendly way to store energy. By mixing boric acid with oil, a suspension is created that can be used in a reactor. The reactor wall temperature is then raised to between 70°C and 200°C. This process creates energy that can be stored and used later. Additionally, this method could capture the energy that would otherwise be lost in industrial plants. However, such temperatures can also be attained simply by concentrating sunlight.

The heat energy storage system developed by Franz Winter and his team works on converting heat energy into a chemical reaction (boric acid -> boric oxide and water), which can then be stored in tanks. The chemical reaction reverses when water is added back to the suspension, and the stored heat energy is rereleased. This process can be repeated endlessly, making it a very efficient way to store energy.

Boric Acid Is In High Demand

Boric acid is a white, powdery substance that has many uses. It can be used as an insecticide, herbicide, and fungicide. It is also used in making glass, ceramics, and enamel. Boric acid is found in borates, which are minerals that contain boron.

Boric acid is commonly used as a wood preservative and fire retardant. It is also used as food and cosmetics preservatives, lubricants, fireproofing agents, etc. With these various uses, it is no wonder that boric acid is an important industrial chemical.

Boric acid is a relatively rare mineral, and as such, 5E Advanced Materials' Fort Cady deposit is an important strategic asset. The company is 100% owner of the deposit, which gives it a strong position in the market. Boric acid is essential for both legacy industries and newer, rapidly growing sectors driven by decarbonization, making it a valuable commodity.

5E Advanced Materials (NASDAQ: FEAM) is well-positioned to take advantage of this high demand for boric acid and generate substantial value for shareholders.

5E is developing a 500KsTPY boric acid operation, which a 5K-7KsTPY lithium carbonate co-product will supplement. The company anticipates reaching total production in the second half of 2027. 5E hopes to use its boric acid as a feedstock for boron advanced materials (Boron+) in the long run. Its mining/refining process will employ low-waste, low-footprint in-situ leaching (ISL).

The global boron/boric acid market is heavily reliant on Turkish supplies, which FEAM believes can help mitigate. The proposed operation of the company at

Fort Cady is expected to have a multiplier effect on the asset's revenue and EBITDA. F5E Advanced Materials believes that its experience and technical expertise will allow it to build a world-class operation at Fort Cady.

Conclusion
Although the technology has already been invented, scientists at TU Wien are still working to improve the process. According to Franz Winter, "Different reactor sizes would be preferable for different applications. These reactors must always be viewed as part of a larger system. Depending on how much heat is generated over what temperatures in an industrial plant, and what other energy technology facilities are already in place, the process must be optimally adapted."

In addition to boric acid, other chemicals such as hydrated salts have also been investigated. Boric acid and salt hydrates have many advantages: they are cheap and easy to obtain, relatively harmless, and stable over many repetitions. They can be stored for an indefinite period.

The reactor technology is scalable to industrial levels. The oil used allows for efficient heat transfer while protecting the reactor and solids during storage.

Scientists believe that this invention represents a significant step forward and will find its way into industrial application in the coming years.

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