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Battelle Number(s):

16882

Patent(s) Issued

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Available Technologies

Iron-sulfide Redox Flow Batteries

SUMMARY

Redox flow batteries are advantageous for energy storage because they are capable of tolerating fluctuating power supplies, repetitive charge/discharge cycles at maximum rates, overcharging, overdischarging, and because cycling can be initiated at any state of charge. However, many systems use redox species that are unstable, are highly oxidative, are difficult to reduce or oxidize, precipitate out of solution, and/or generate volatile gases.

Existing approaches to addressing these disadvantages include the imposition of restrictive operating conditions, the use of expensive membranes, the inclusion of catalysts on the electrodes, and/or the addition of external heat management devices. These approaches can increase the complexity and the cost of the total system significantly. Therefore, a need for improved redox flow battery systems exists.

To meet this need, PNNL scientists have developed iron-sulfide redox flow battery systems that demonstrate excellent energy conversion efficiency and stability and utilize low-cost materials. The systems are characterized by a positive electrolyte that comprises Fe(III) and/or Fe(II) in a positive electrolyte supporting solution, a negative electrolyte that comprises S2 - and/or S in a negative electrolyte supporting solution, and a membrane, or a separator, that separates the positive electrolyte and electrode from the negative electrolyte and electrode. The use of supporting solutions is beneficial because they will not corrode components of the battery system. The iron-sulfide redox flow battery systems can be advantageous for energy storage, particularly when the electrolytes have pH values greater than 6.

ADVANTAGES

* Exhibit improved energy conversion efficiency and stability for energy storage
* Reduce corrosion in battery system components
* Use low-cost materials that are safer and more environmentally friendly

U.S. DEPARTMENT OF ENERGY

Patents & Intellectual Property

» 8,609,270

Technology Portfolio(s)

» Energy Storage

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