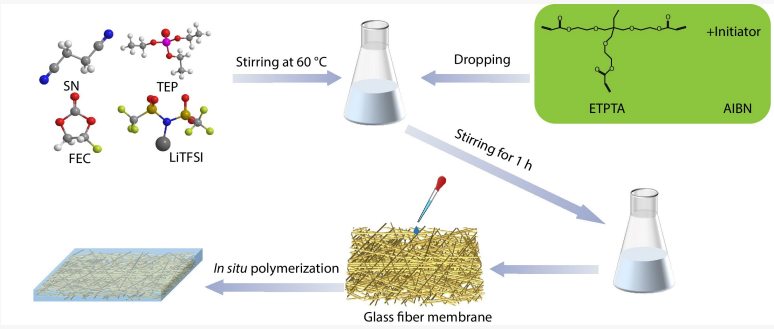
Safer and stronger: new non-flammable electrolyte extends battery life

USA, May 16, 2024 /EINPresswire.com/ -- Researchers have introduced a new quasi solid-state succinonitrile-based electrolyte for lithium-ion batteries that enhances safety and longevity. This groundbreaking work presents a leap forward in the quest for batteries that are not only safer but also perform better over extended periods.



Graphic abstract.

Lithium-ion batteries are integral to numerous applications, ranging from everyday electronics to electric vehicles. Despite their widespread use, these batteries pose safety risks due to the flammable liquid electrolytes they typically contain, which can lead to dangerous fires and explosions. In response to these safety concerns, there has been a concerted effort within the scientific community to develop safer alternatives that maintain, or even enhance, battery performance while mitigating fire hazards.

In a significant advancement in battery technology, scientists at Shenzhen University have developed a novel quasi solid-state electrolyte that considerably enhances the safety and performance of lithium-ion batteries. The study (DOI: 10.1007/s10118-023-2970-y), published in April 2023 in the Chinese Journal of Polymer Science, details the electrolyte's ability to withstand higher voltages and its non-flammable properties.

This novel formulation blends succinonitrile, a substance with a high dielectric constant and low flammability, with innovative additives like triethyl phosphate (TEP) and fluoroethylene carbonate (FEC). These additives are key to the electrolyte's enhanced safety profile and performance. TEP serves as a flame retardant, significantly reducing the flammability of the electrolyte, which is crucial for preventing fires in battery-operated devices. FEC, on the other hand, forms a protective layer on the lithium metal anode, improving the battery's stability and efficiency over numerous charge cycles. The electrolyte demonstrates superior ion conductivity at room temperature and maintains a wide electrochemical stability window of over 5.3 volts, which is indicative of its ability to operate safely at higher voltages than typical battery electrolytes. These properties ensure that the battery can handle more energy-dense configurations, crucial for applications requiring high power output over extended periods, such

as electric vehicles and portable electronic devices. This research paves the way for batteries that are not only safer but also more reliable and longer-lasting.

Professor Cai-Zhen Zhu, a lead researcher on the project, stated, "Our goal was not just to make lithium-ion batteries safer but also more efficient. By developing a non-flammable electrolyte that operates effectively at high voltages, we are paving the way for next-generation batteries."

The implications of this research are profound for the battery industry. This new electrolyte not only increases the safety of lithium-ion batteries by preventing fires but also enhances their longevity and reliability, crucial for applications in high-stakes environments like electric vehicles and space travel.

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