NPORE® Ceramic Separators

Nanocomposite separators for increased battery safety

NPORE® is the world's first flexible, free-standing ceramic nanoporous membrane separator for lithium-ion batteries. Patented NPORE® separators eliminate the use of a plastic substrate, while providing superior functionality and outstanding heat resistance for current and next generation lithium-ion batteries.

As the demand for electric vehicles (EVs) and high-energy storage systems accelerates, next-generation batteries must deliver increased performance at lower cost, all while satisfying stringent safety requirements. The separator is arguably the most important component for achieving safety at the cell level, separating and insulating the positive and negative electrodes of lithium batteries from each other, but standard separators' plastic layers can shrink under high heat, compromising the safety of the cell. In contrast, NPORE® separators' high temperature stability and unique properties help reduce the risk of thermal runaway. These battery innovations are covered by a large portfolio of pending and issued patents worldwide (see, metamaterial.com/intellectual-property).

BENEFITS

- NON-FLAMMABLE
- UNIFORM AND NARROW PORE SIZE DISTRIBUTION
- <1% SHRINKAGE AT 220°C
- 5X HIGHER THERMAL CONDUCTIVITY
- 3X GREATER COMPRESSION RESISTANCE
- SUPERIOR ABUSE RESISTANCE

APPLICATIONS


Lithium-ion Batteries


Electric Vehicles


Aerospace Battery Safety

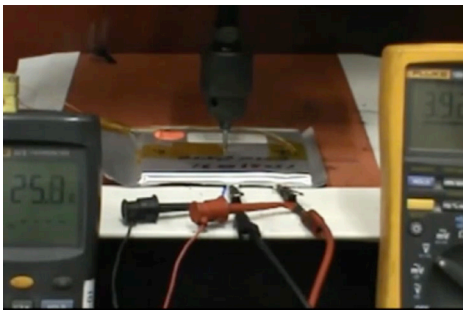
SPECIFICATIONS

Thermal Stability	Best-in-class dimensional stability with <1% shrinkage at 220°C Enables drying of cell stacks or jelly rolls at 130°C or higher Up to 5x higher thermal conductivity vs. plastic separators Non-flammable
Electrochemical Performance	Rapid and complete wet out with battery electrolytes Greater compression resistance vs. plastic separators Excellent electrolyte conductivity Uniform and narrow pore size distribution Excellent chemical stability

Increased Battery Safety

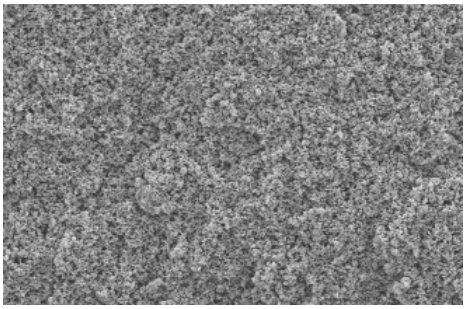
Nail penetration testing is a type of safety testing done to simulate internal short-circuiting. The sample battery is penetrated with a nail to simulate an internal short-circuit and verify that the battery does not catch fire or burst.

The images below demonstrate the dramatic benefits of NPORE® nanoporous ceramic battery separators over typical polyolefin (PE) separators in lithium-ion batteries.

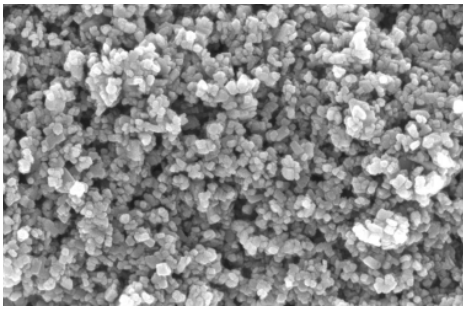


NPORE® Separator
Same cell design and capacity, the only difference is the separator

Polyolefin Control Separator
Same cell design and capacity, the only difference is the separator



Cross-Section NPORE® Separator
(Magnification: 5000x)



NPORE® 20 Surface
(Magnification: 75,000x)

Contact us for more information on the product and intellectual property.
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META®
Go Beyond.