Safe ESS-Power Battery Pack

Thermal Runaway Experiment and Application Case Study

Mobility Energy Co., Ltd. Battery Safety R&D Center provides comprehensive experimental test data on pouch-type lithium-ion battery thermal runaway prevention technology, conducted in-house.

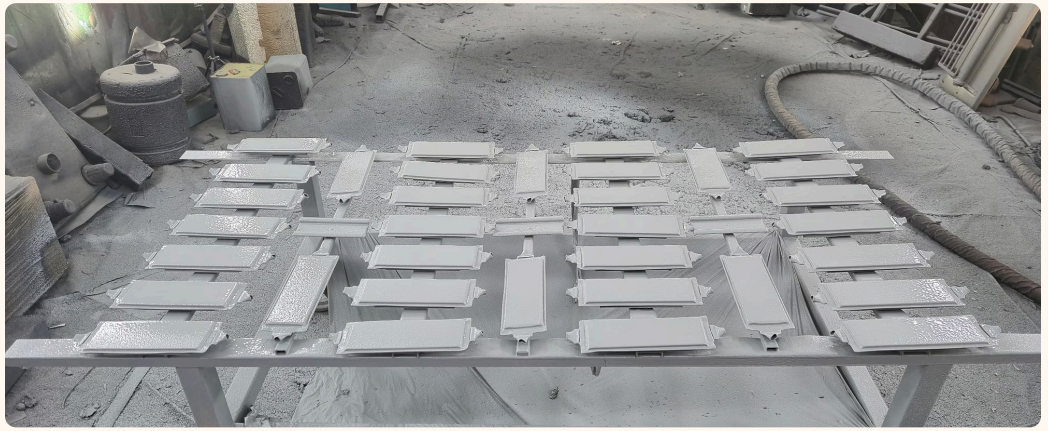
Innovative Explosion Mitigation Solution: The Power of Vanadium and Polyvinyl Alcohol Composite Coating

Discover cutting-edge explosion mitigation technology that combines Vanadium and Polyvinyl Alcohol (PVA) to create an unprecedented protective barrier. This innovative composite coating provides superior tear strength and elasticity, safeguarding critical facilities from explosion threats and representing the future of structural defense. As modern security challenges evolve, so too must our protective solutions.

Absorbing Impact Like a Shield

Advanced simulations demonstrate how explosive energy is captured and dispersed through the vanadium-PVA coating matrix, transforming destructive forces into manageable stress distribution across the protected surface.

The Core of Blast Mitigation: Why Tear Strength and Elasticity Matter



Protection from Shockwaves and Fragments

When an explosion occurs, two primary threats emerge: powerful shockwaves that can compromise structural integrity, and high-velocity fragments that penetrate vulnerable surfaces. The first line of defense requires materials designed to withstand these extreme forces.

Blast mitigation solutions featuring vanadium-polyvinyl alcohol blends offer exceptional tear strength and elasticity, crucial for absorbing and distributing explosive energy across the protected surface. This dual functionality minimizes structural damage while maintaining barrier integrity even under extreme conditions.

Military Facilities

An essential defense layer for command centers and strategic installations

Government Buildings

Critical protection for administrative and public service structures

Critical Infrastructure

Essential safety measures for energy, communication, and transportation hubs

Lithium-ion Battery Thermal Runaway Test

We conducted forced explosion tests on SK 3.6V 60AH pouch batteries to evaluate thermal runaway behavior and its effects on surroundings. The results from the explosion-proof experimental environment confirmed no impact on adjacent batteries even under forced explosion conditions.



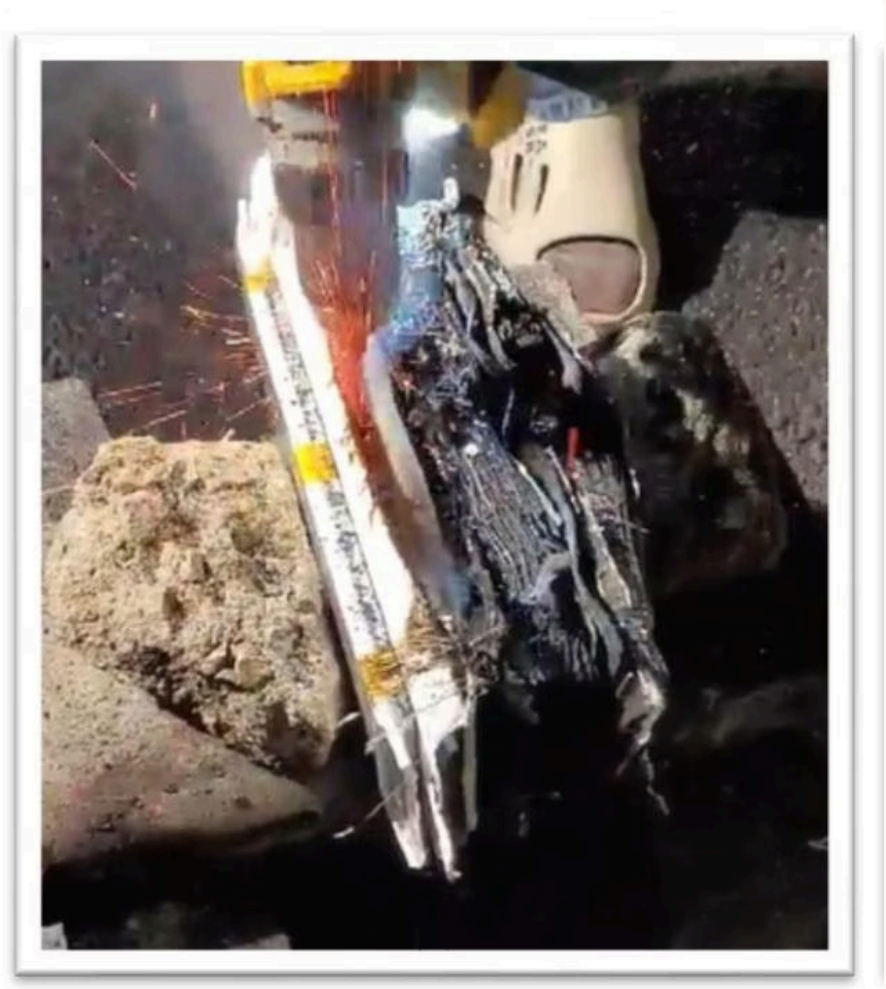


Primary Coating Technology Test

Key Fire Retardant Coating Experiment

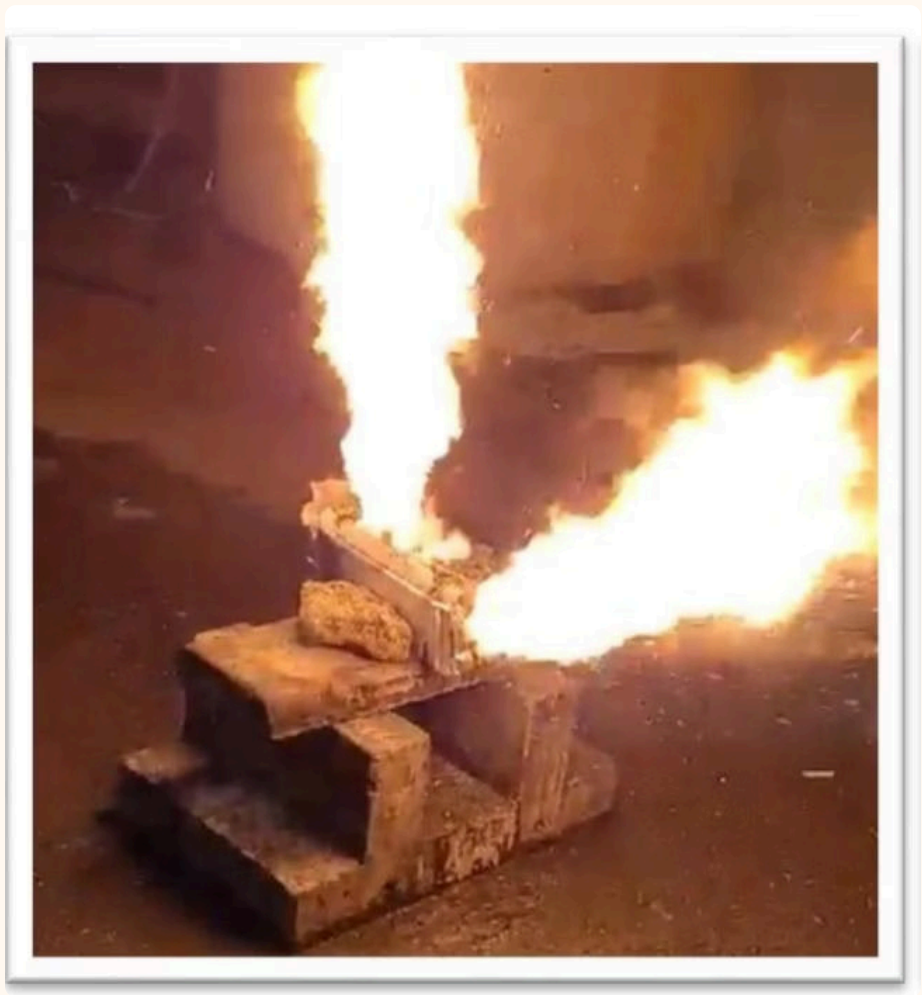
1 Initial Impact

New battery at the far left, forced impact explosion initiated on the second row battery



2 Side Thermal Runaway

Second battery experiences side thermal runaway and flame emission, impact-induced fire occurs in the second row battery

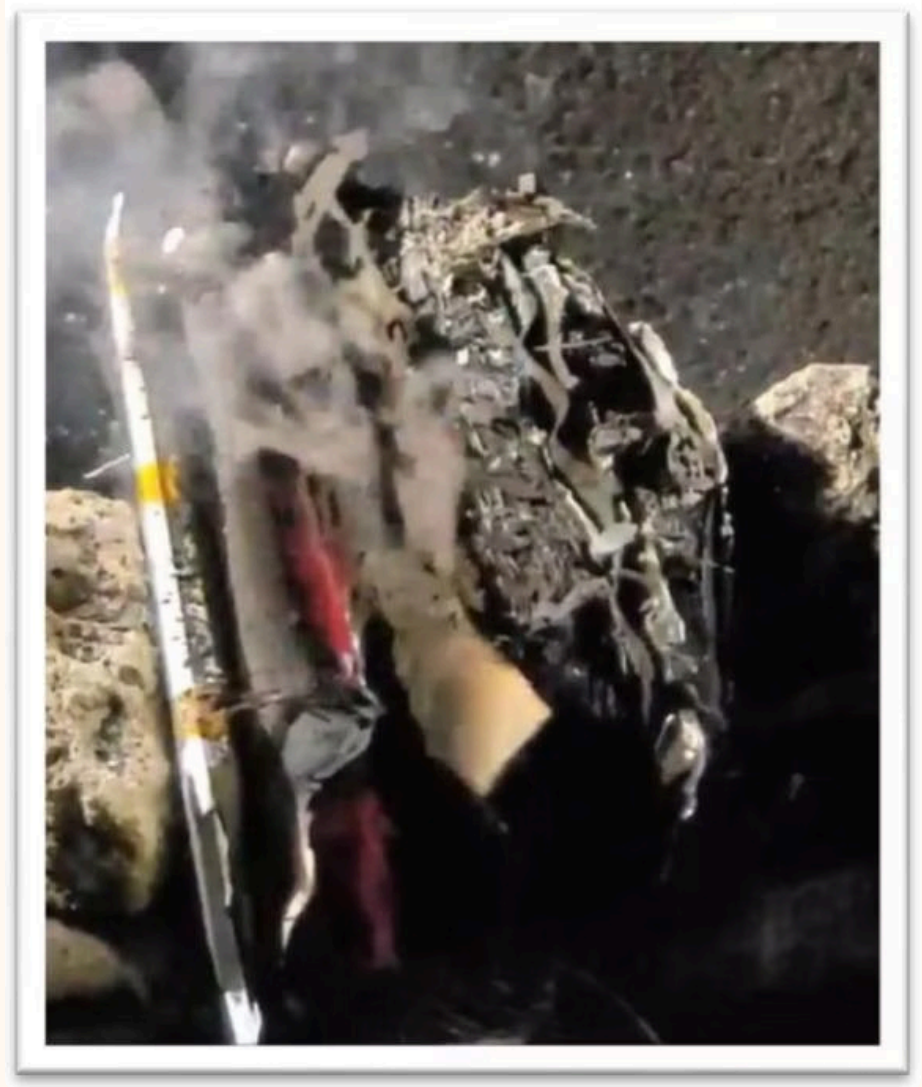


3 Natural Extinction

After battery thermal runaway, flames decrease and the fire source extinguishes naturally

4 Protected Battery

The new battery at the far left remains safe and undamaged, no thermal runaway



Secondary Coating Technology Test

Test Procedure

The batteries were subjected to thermal runaway after forced impact explosion initiation. The uncoated side battery was consumed by fire during thermal runaway.

Key Finding: No fire occurred in the coated batteries, demonstrating effective fire prevention.

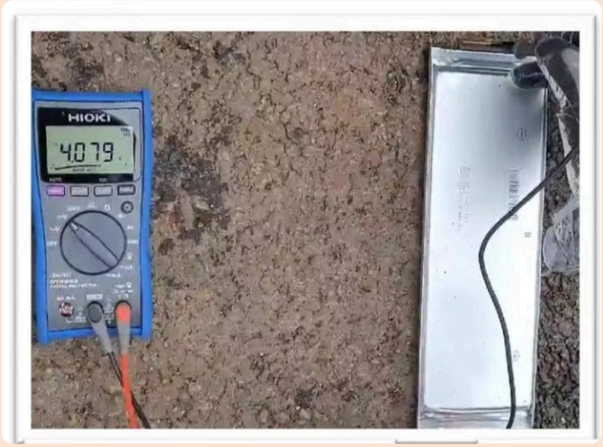
Third Coating Technology Test

Comparative Analysis of Uncoated vs. Coated Battery Response

Pre-Test Condition

Battery Voltage Test: 4.07V

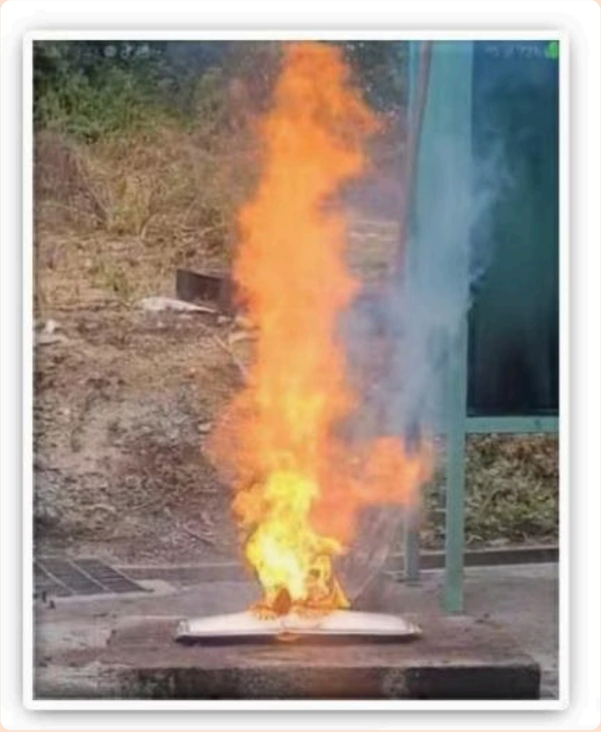
Battery Condition Before Coating Application



Uncoated Battery Response

Standard Battery Fire Condition Due to Impact

Thermal Runaway Flame Generation Observed



Coated Battery Response

Test Coating Agent Applied to Battery

Impact Applied After Coating

Gas Emission Only, No Fire

Smoke Emission Followed by Fire Extinction

Fourth Test: Advanced Protection

Secondary Explosion Protection + Coating Technology

Four battery packs were bundled together, and a drill impact was applied to the second battery cell. The explosion-proof coated pack demonstrated excellent safety performance with a ventilation device that allowed gas to escape without the risk of explosion.

01

Impact Application

Drill impact applied to the second battery cell bundled in a 4-pack.

02

Smoke Emission

Smoke emission started from the second battery cell.

03

Safe Ventilation

Only smoke was emitted from the second row, with no fire. The ventilation device released gases, eliminating the risk of explosion.

04

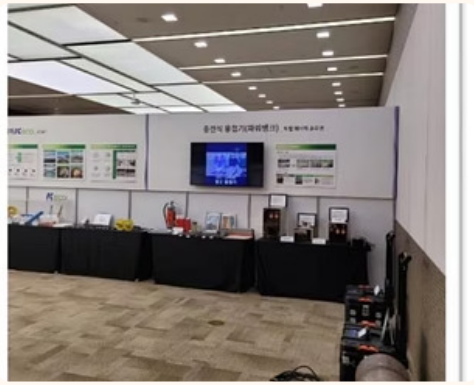
Post-Test Analysis

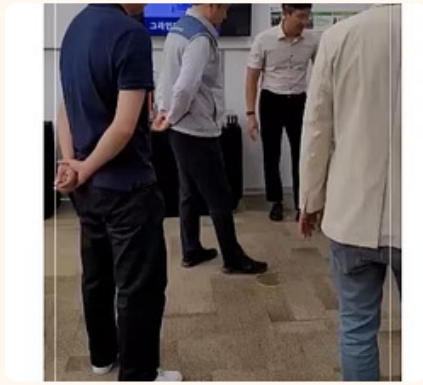
The isolated second-row cell did not experience thermal runaway. Surrounding batteries remained unaffected. There was no fire due to forced impact.

Samsung Engineering Headquarters Exhibition

Sample Exhibition: July 24-28, 2023

Mobility Energy showcased advanced battery safety technology at Samsung Engineering Headquarters, demonstrating explosion-proof coating solutions and fire prevention systems to industry leaders.





Samsung Semiconductor Factory Approval

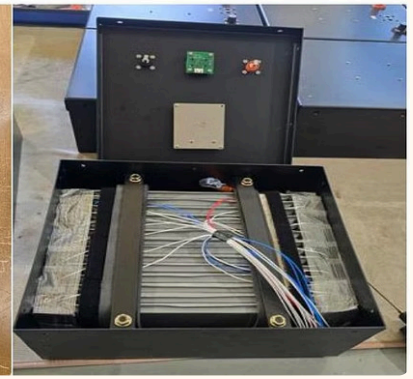
Safety Team Headquarters Self-Inspection Certification

Mobility Energy's explosion-proof battery coating technology has received official approval for use in Samsung Semiconductor factory facilities. Samsung C&T's Safety Team Headquarters conducted a comprehensive self-inspection and issued a certification sticker, verifying the technology's safety standards for critical industrial applications.

Mobile Charging Station Development

Contract for Safety Explosion-Proof Coated ESS Battery

Mobility Energy has secured a contract for the development of mobile charging stations applying advanced explosion-proof coated ESS battery technology. This project includes comprehensive application of explosion-proof coating to battery packs and integration of safety systems.



Latest Research: PVA/Graphene Oxide/Phytic Acid Composite (PGP)

A groundbreaking 2024 study by Lanzhou University has demonstrated remarkable advancements in PVA-based protective coatings. By incorporating graphene oxide and phytic acid into a PVA matrix, researchers achieved performance levels significantly surpassing conventional materials.

2x

Enhanced Strength

Tensile and tear strength increased by more than 2x compared to pure PVA formulations.

66.5%

Heat Reduction

Heat of combustion reduced by 66.5%, significantly improving fire resistance.

2s

Rapid Response

Fire alarm activated within 2 seconds after thermal threat detection.

2400s

Extended Alert

Continuous alarm functionality exceeding 2,400 seconds for emergency response.

UL-94 V-0 Rating Achieved: The PGP composite demonstrated self-extinguishing properties within 10 seconds and achieved the highest flammability rating with no flame dripping. This certification proves its excellent fire safety performance, which is crucial for explosion mitigation applications.

Mechanical Properties of Vanadium-Based Flame Retardants Mixed with Polyvinyl Alcohol

Enhanced Composite Performance

Research into polyurethane composites incorporating vanadium and lightweight fillers has confirmed significant strength improvements. The strategic addition of these components creates material systems optimized for both thermal protection and mechanical durability.

The combination of sodium silicate with vermiculite and perlite fillers creates a synergistic effect that enhances both thermal resistance and tensile strength. This multi-component approach addresses the complex demands of explosion mitigation, which must withstand not only initial explosive force but also subsequent thermal and structural stresses.

Improved Tensile Strength

Vanadium compounds significantly increase the material's resistance to tensile forces, ensuring the coating remains intact even under explosive expansion pressures.

Superior Thermal Resistance

The integration of sodium silicate provides an excellent thermal barrier, protecting underlying structures from the intense heat generated during an explosion.

Extreme Pressure Durability

This composite can withstand extreme compressive and deformative forces, maintaining its protective capabilities even in the most demanding explosion scenarios.

Conclusion: The Future of Defense Technology

Vanadium-Polyvinyl Alcohol Composite Blast-Resistant Coatings

Extreme Environment Durability

Engineered to withstand the most demanding conditions, this coating provides reliable protection under extreme pressure, temperature, and mechanical stress. The robust barrier created by the Vanadium-Polyvinyl Alcohol (PVA) composite ensures long-term performance without degradation, maintaining its protective capabilities over an extended service life.

Sustainable Advanced Materials

The convergence of sustainable materials science and cutting-edge composite technology creates an environmentally responsible solution without compromising performance. This approach balances immediate protection needs with long-term environmental stewardship, representing responsible innovation in defense materials.

Essential Innovation for Safer Communities

As threats to critical infrastructure evolve, Vanadium-Polyvinyl Alcohol blast-resistant coatings stand as an indispensable protective solution. This technology transforms our approach to facility security, moving from passive reinforcement to an active, integrated defense system capable of saving lives and preserving essential services.

The Way Forward: Continued research and field application of Vanadium-PVA composite coatings promise even greater protective capabilities. As materials science advances, these innovative solutions will become increasingly accessible, creating safer environments for soldiers, public servants, and civilians alike.

Official Safety Certifications

KC Safety Certification and Broadcasting and Telecommunications Equipment Registration

KC Safety Confirmation

Certificate No.: XD100040-22001A

Product Name: Battery Pack

Model Name: MB4000F

Rating: 35.2V, 11,850 mAh

Standard: KC 62133-2 (2020-07)

Date: March 23, 2022

Broadcasting and Telecommunications Equipment Registration

Registration No.: R-R-MEn-MPB-7460

Product Name: Power Bank

Model Name: MPB-7460

Date: November 22, 2023

Certified in accordance with Article 58-2, Paragraph 3 of the Radio Waves Act.

International Test Report

Standard: EN 62133-2:2017

Report No.: KR21-YBC0013

Testing Laboratory: KCTL INC.

Model Name: ACM-3607

Rating: 36V, 6,700 mAh

Date: August 26, 2021