

Flame Retardants: Safety in Electric Vehicles



Electric vehicles (EVs) are transforming transportation with cleaner energy and advanced technology, but they also introduce new safety challenges. EVs require high-voltage systems, lithium-ion batteries, and complex electronics to operate under extreme conditions, making fire prevention a critical priority that flame retardant chemistries help to achieve.

Flame retardants integrated into EV components help to reduce ignition risk, slow flame spread, and meet stringent global safety standards. They enable manufacturers to use a wider variety of component materials that allow for lighter, more efficient vehicles without compromising protection. Beyond safety, flame retardants drive compliance, durability, and sustainability, helping automakers meet codes and regulations while supporting the U.S. economy and its global competitiveness.

From battery enclosures and wiring harnesses to charging stations and interior components, flame retardants can help safeguard layers throughout electric vehicles.



Statistics and Research:

- EV fire events occur less frequently than gas-powered cars, but [they are harder to control](#).
- Up to [30% of EV fires](#) occur during charging, where connectors and housing can contain FRs to enhance fire protection.
- 13% of EV battery fires [reignite days later](#), making flame-retardant barriers critical for containment.
- EV battery fires often [require thousands of gallons of water](#) to extinguish, but flame retardants help prevent further escalation.
- Interior fires [account for 30%](#) of vehicle fire fatalities, making flame-retardant dashboards and seating essential.
- Flame-retardant materials enable compliance with [UL 94 V-0](#) and [FMVSS 302](#), reducing ignition risk by up to 90% in tested components.

Why Flame Retardants Matter in EVs

High Voltage Risks

- EVs rely on lithium-ion batteries and complex electrical systems, which introduce additional potential for fire development.

Fire Safety Challenge

- If vehicular fires develop, flame retardants can help prevent ignition and slow flame spread.

Compliance

- Essential for meeting safety standards around the globe like UL 94 V-0, FMVSS 302, and UN-ECE R100.

Benefits to the EV Manufacturing Industry

- **Enhanced Safety:** Reduces fire hazards, giving occupants critical escape time.
- **Durability & Performance:** Maintains thermal stability and mechanical strength under high operating temperatures.
- **Lightweight Design:** Enables use of advanced polymers for weight reduction without compromising safety.
- **Regulatory Compliance:** Supports adherence to stringent automotive fire safety standards worldwide.



Key Applications in EVs and Components

Battery & Energy Systems

- Battery Enclosures and Module Housings
- Cell Spacers and Insulation Films
- Battery Management System (BMS) Boards

Electrical & Electronic Components

- Power Electronics (Inverters, Converters)
- Onboard Chargers
- High-Voltage Wiring Harnesses
- Connectors and Terminals

Charging Infrastructure

- Charging Plugs and Sockets
- Wall Boxes and Public Charging Stations

Interior and Structural Components

- Dashboard and Instrument Panels
- Seating Foams and Upholstery
- Adhesives and Sealants

Thermal Management & Safety

- Cooling System Components
- Gaskets and Seals
- Protective Shields and Covers

By reducing fire risks associated with batteries, wiring, interior components, and charging systems, flame retardants help electric vehicles meet global safety standards while supporting lightweight design and durability. As EV adoption accelerates, flame retardants ensure that progress doesn't compromise protection, helping keep drivers safe worldwide.