



Epic S7253-01 Potting Compound: **MITIGATING THERMAL RUNAWAY IN CYLINDRICAL BATTERY PACKS**

Safety is at the forefront of concerns when testing an e-bike or LEV battery pack for use in everyday life. The challenge in this study was to find a material to mitigate thermal runaway and its propagation within battery cells. The solution was the use of a potting compound that stops propagation.

Among the most challenging battery cell applications for a potting material are high nickel cathode cylindrical cells. Not only must a potting material be UL 94 V-0 recognized and have good processable viscosity, it must also be capable of mitigating thermal runaway and its propagation.

Our customer, Electric Goddess, partners with clients for the research and development of battery systems in industry leading production designs. Their mission is to advance the development of electrification while keeping earth thriving. In this application, Electric Goddess partnered with us to provide a potting material for use in e-bike and light electric vehicle (LEV) battery packs.

Challenge

In this case, it was the goal of Electric Goddess to find an economical, high performing potting material for the unique and demanding requirements of their high nickel cathode cylindrical battery cells. A material was needed to control and extinguish any thermal event that may occur within the battery cells in order to maintain safety for the end user.

Solution

Our team suggested two solutions to Electric Goddess: **Epic S7253-01** and **S7527-04**. Although both are two-component, UL 94 V-0 recognized polyurethane potting compounds, **S7253-01** was ultimately chosen because of its propagation results. Also, the lower viscosity of the material enabled better fill, and the lower density helped to achieve a lightweight product and reduced shipping costs.

Testing

Extensive testing was done with S7253-01 and comparable products. Epic Resins worked with Electric Goddess on formulation modifications in order to meet all application specifications for viscosity, stability, flame retardant composition and density.

APPLICATION:

- ▶ Battery pack potting for e-bikes and light electric vehicles (LEV)

SPECIFICATIONS NEEDED:

- ▶ UL 94 V-0 recognized
- ▶ Low mixed viscosity
- ▶ High operating temperature
- ▶ Easily processable
- ▶ Economical price

CASE STUDY

PRODUCT PERFORMANCE

Epic S7253-01 is formulated with a unique combination of both mineral and non-halogenated flame retardants, with an emphasis on particle size distribution to create a protective firewall between battery cells. Results of a laboratory induced thermal runaway event showed there was no propagation. However, the failure criteria is not more than six cells or the cells immediately surrounding the initiation cell.

Summary of Customer's Results & Benefits:

- ◆ Provided propagation mitigation needed
- ◆ Excellent thermal conductivity of 0.78 W/mK
- ◆ Workable viscosity
- ◆ Adjustable reactivity
- ◆ Convenient mix ratio for high volume production
- ◆ Safe and high quality end product

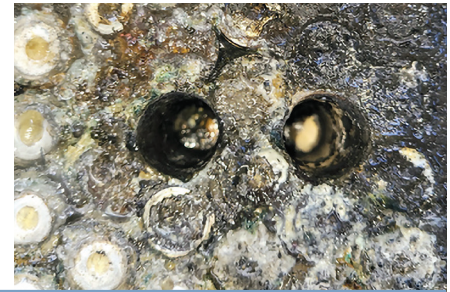
EPIC S7253-01						
UL Flame Rating	Mix Ratio by Weight	Mixed Density	Mixed Viscosity	Gel Time	Coefficient of Thermal Expansion	Thermal Conductivity
Recognized UL 94 V-0 @ 9.0 mm	100A:18.2B	11.50 - 11.80 lb/gal	1,600 - 2,000 cps @ 25°C, 20 rpm	20 - 40 min @ 25°C (100 g)	165 (Exp-6)/°C (from 20 - 40°C)	0.77 - 0.79 W/mK



▲ In test photo: LEV circuit board



▲ Breakdown photos: not representative of trade secret test set up



NIMBLE & RELIABLE PARTNER

The chemists at Epic Resins worked directly with the scientists at Electric Goddess, enabling an effective solution that fit the exact requests. The Epic Resins team moved quickly with formulation adjustments so that time to market was reduced.

About Epic Resins

Founded in 1958, Epic Resins has earned an international reputation as a leading formulator, manufacturer and supplier of epoxy resin and polyurethane solutions. Our philosophy is based on listening to your needs and developing quality solutions to meet your challenges. We built our company on technology-proven chemistry and a wealth of market and application knowledge. This guarantees you consistent products and maximum value.

Ask our technical sales staff how we can help your application with an innovative epoxy or polyurethane solution.

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“I appreciate Epic Resins formulating with economical materials that work well for mass production. This has a positive global impact on safety.”

— Luke Workman, Chief Scientist
at Electric Goddess