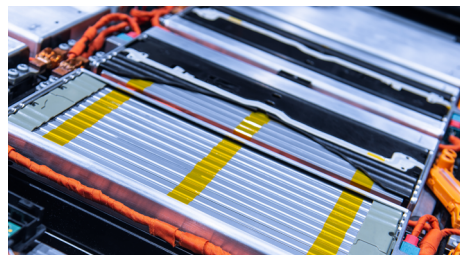
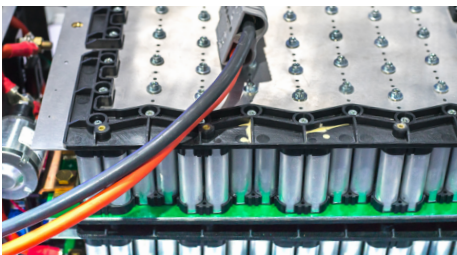
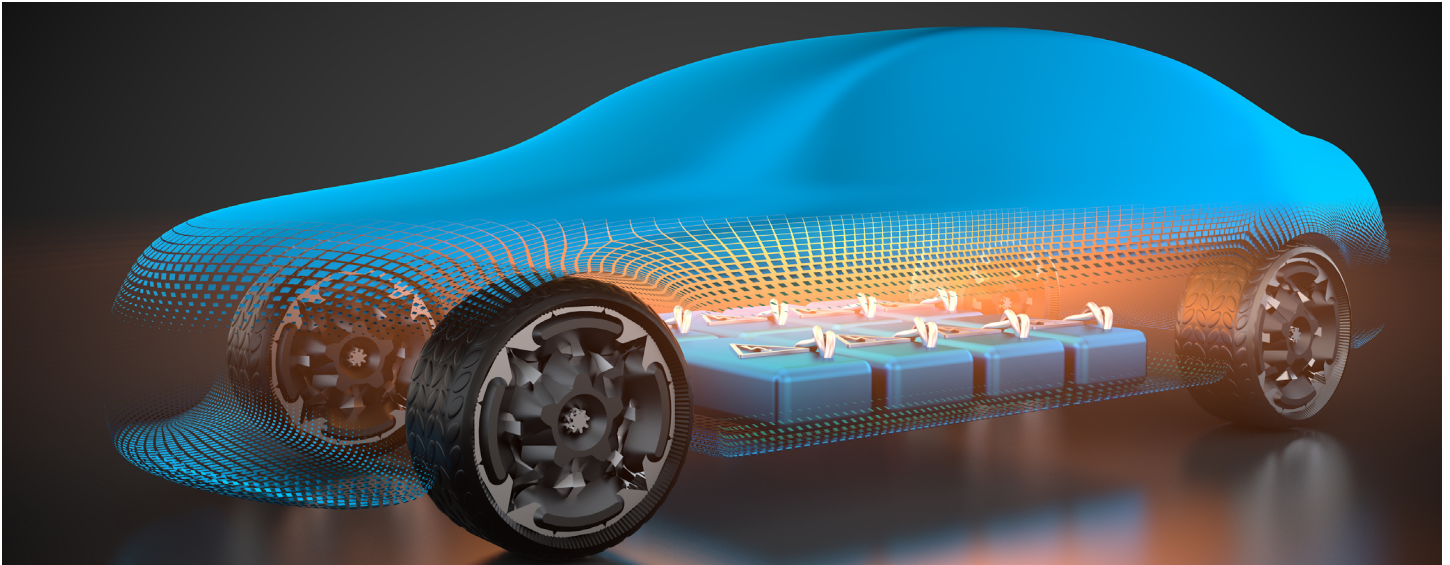


Thermal management – VORATRON™ Polyurethane Systems

How can we help improve H/EV battery technology?



Electrification is revolutionizing the mobility industry. Everyone knows that. What you may not realize is that Dow is well prepared to play a key role. By helping develop battery systems that not only offer safe, efficient performance, but can also make significant contributions to a reduced carbon footprint.

MobilityScience™ – Dow's platform for driving innovation in the transportation/mobility industry – is helping OEMs and tiers navigate the complex, rapidly growing hybrid/electric vehicle (H/EV) market with a broad portfolio of materials and services that can help improve performance, processability and sustainability.

Our back integrated capabilities in material science, research, development and manufacturing provide a unique skillset for the evolving challenges faced by H/EV batteries. By combining organic, inorganic and hybrid chemistries – along with advanced R&D technology and close collaboration – we can develop groundbreaking solutions that help address:

- The need for higher energy density
- Increasing requirements for safe and efficient thermal management
- Efficient vehicle manufacturing processes
- OEM in-house assembly EH&S standards

VORATRON™ Technology solutions

One of our offerings, **VORATRON™ Polyurethane Systems**, is supporting the drive for e-mobility with advanced materials for battery pack assembly and other electric powertrain needs.

VORATRON™ systems allow the development of thermally conductive and non-thermally conductive **adhesives, gap fillers** and **pottants/encapsulants** for a broad range of battery types, including prismatic, pouch and cylindrical cells. In addition to enhancing battery performance, safety and efficiency, these customizable, two-part, room temperature curing polyurethane (PU) systems feature low densities that enable lighter weight powertrains for reduced vehicle weight and lower CO₂ emissions.

The power of versatility

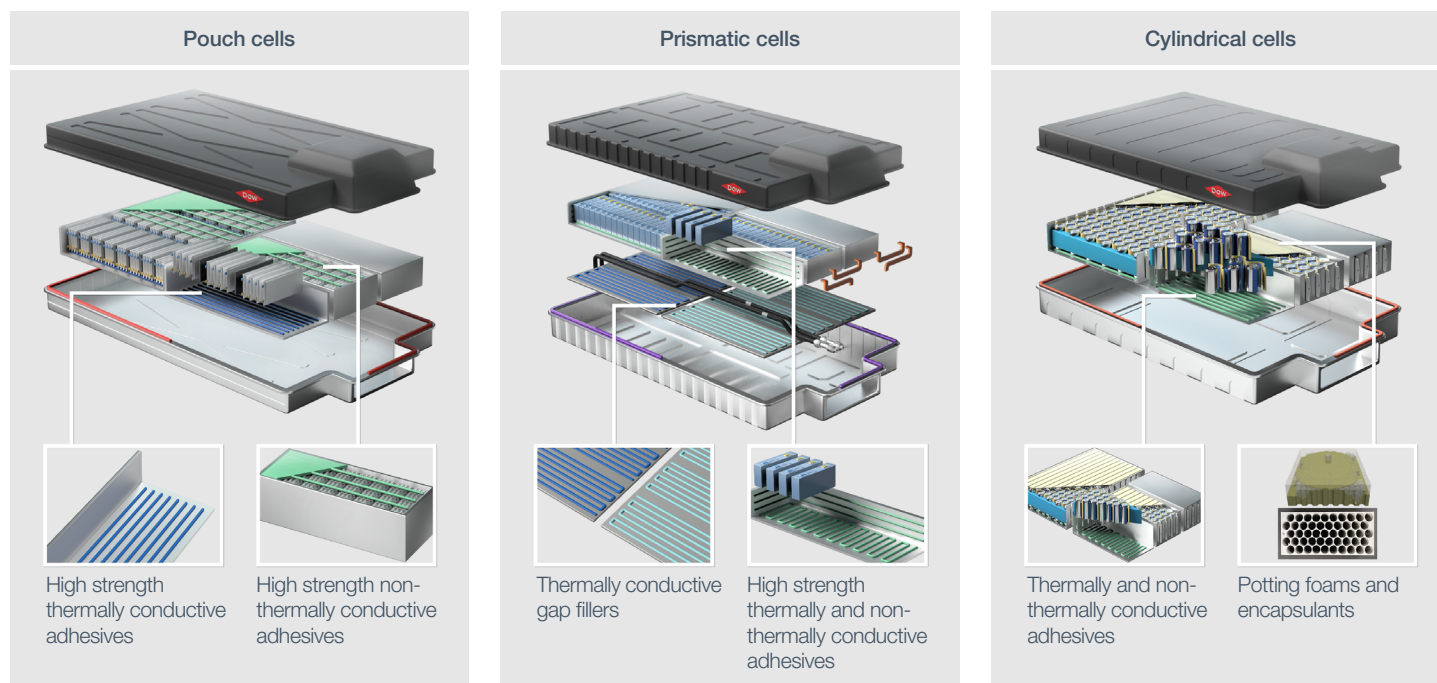
Figure 1 shows the critical roles that VORATRON™ Polyurethane Systems can play as adhesives, gap fillers and pottants/encapsulants. These innovative materials can support both thermal and structural management needs, with the ability to deliver powerful cell-to-cell, cell-to-module and cell-to-pack bonding, as well as potential for cell-to-chassis adhesive applications. They also enable gap fillers with very low squeeze force levels and extremely lightweight potting foams – all of which are specifically designed to meet the unique demands of H/EV battery systems.

Collaborate to innovate

Collaboration is at the center of everything we do – it powers our ability to work smarter and accelerate innovation in the mobility industry. Working closely with OEMs and tier suppliers, we draw upon all our MobilityScience™ resources to find the most uniquely suited solution – whether that's polyurethane materials or some combination of other chemistries. We combine decades of material science expertise in transportation with the incredible knowledge of our customers, then apply advanced modeling and predictive intelligence capabilities – as well as rigorous testing – to produce a custom-tailored, holistic answer to the challenge at hand.

Please contact your Dow representative or visit us online at dowmobilityscience.com to learn more about how MobilityScience™ and VORATRON™ Polyurethane Systems can help drive the future of H/EV battery technology.

Figure 1: VORATRON™ PU Systems for various battery designs



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