Thermal management – VORATRON™ Polyurethane Systems

# How can we build stronger bonds?

Battery pack adhesives are critical to the success of H/EV batteries – and H/EVs. If your adhesive weakens or – perish the thought – fails, battery life and vehicle performance can be severely impacted. Our rich portfolio of solutions helps ensure strong, long-lasting bonds that maintain high levels of performance under harsh conditions.

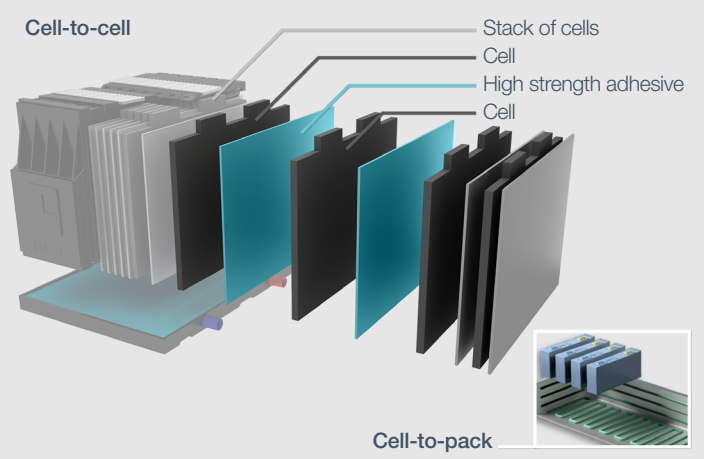
MobilityScience™ – Dow's platform for driving innovation in the transportation/mobility industry – is helping OEMs and tiers navigate the complex, rapidly growing hybrid/electric vehicle (H/EV) market with a broad range of materials and services that can help improve performance, processability and sustainability.

## VORATRON™ Systems for battery assembly adhesives

VORATRON™ MA 8200 Series Polyurethane Systems are designed to offer outstanding bonding strength – meeting the most demanding performance and quality needs of virtually any type of cell or battery.

In fact, the VORATRON™ MA 8200 series has been developed to align with the evolution of H/EV battery technology. As a result, these powerful adhesives not only enable traditional cell-to-cell bonding and the more recent cell-to-module approach, but also the latest application, cell-to-pack bonding (Figure 1). As this product line continues to develop and expand, it should also allow the next step in the evolution, cell-to-chassis bonding.

**Figure 1:** Cell-to-cell and cell-to-pack bonding




In addition to their exceptional bonding capabilities, these two-part, room temperature cure systems offer opportunities for custom-tailored thermal conductivity, toughness, elongation, vibration inhibition and filler packages.

**Table 1:** Selected VORATRON™ MA 8200 Polyurethane Systems for low to medium thermal conductivity[1]

| Key attributes | Units | 0.3W | 0.4W | 1.2W | 2.0W |
|---|---|---|---|---|---|
| Adhesion strength – lap shear (Al/Al) | MPa | >9 | >8 | >7 | >5 |
| Adhesion strength – cross tensile (Al/Al) | MPa | >9 | >8 | >7 | >5 |
| Storage modulus (DMA) | MPa | 300-600 | 300-600 | — | 120-150 |
| Elongation at break | % | 80-90 | — | 10-15 | 8-10 |
| 2-part, room temperature cure, open time >20 min. | — | ✔ | ✔ | ✔ | ✔ |
| Thermal conductivity | W/mK | 0.3 | 0.4 | 1.2 | 2.0 |

## Powerful, customized performance

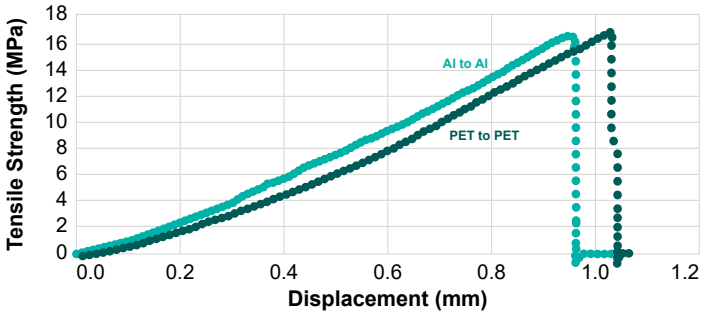
Table 1 shows the exceptional performance of VORATRON™ MA 8200 Series Polyurethane Systems across a range of low to medium thermal conductivity. In addition to offering extremely high bonding strength, the toughness and elasticity of VORATRON™ MA 8200 adhesives can also be adjusted and optimized.

It's important to note that these high levels of performance are achieved with both optimal rheokinectics for battery assembly and low abrasion materials to help minimize wear and tear on dispensing equipment. And, as previously mentioned, filler content and types can also be tailored to meet specific needs.

Figure 2 further illustrates the high cross tensile strength of VORATRON™ MA 8200 systems, with levels greater than 10 MPa on substrates such as Aluminum to Aluminum (Al to Al), PET to PET or their combination. Equally important, these high values are maintained under extensive exposure to stringent environmental conditions. This can be extremely valuable for prismatic cell-to-pack battery designs, as well as other uses in cell-to-wall, cell-to-bottom, and cell-to-module designs.

[1] Typical values, not to be construed as specifications. Users should confirm results by their own tests.

**Figure 2:** Cross tensile strength of VORATRON™ MA 8200 Polyurethane Systems (0.3W)[1]




## Ready to bond?

Our desire for strong bonds doesn't begin and end with VORATRON™ systems.

We partner with OEMs and tier suppliers, drawing upon all our MobilityScience™ resources to find the best possible solution. By combining decades of material science, technological and R&D expertise with the tremendous knowledge of our customers, we're able to develop innovative, efficient and sustainable solutions to mobility challenges.

Please contact your Dow representative or visit us online at **dowmobilityscience.com** to learn more about MobilityScience™, VORATRON™ Polyurethane Systems and our full portfolio of advanced battery pack adhesive solutions.

For more information about Dow, visit www.dow.com/about. To contact a Dow representative, visit, www.dow.com/contact.



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