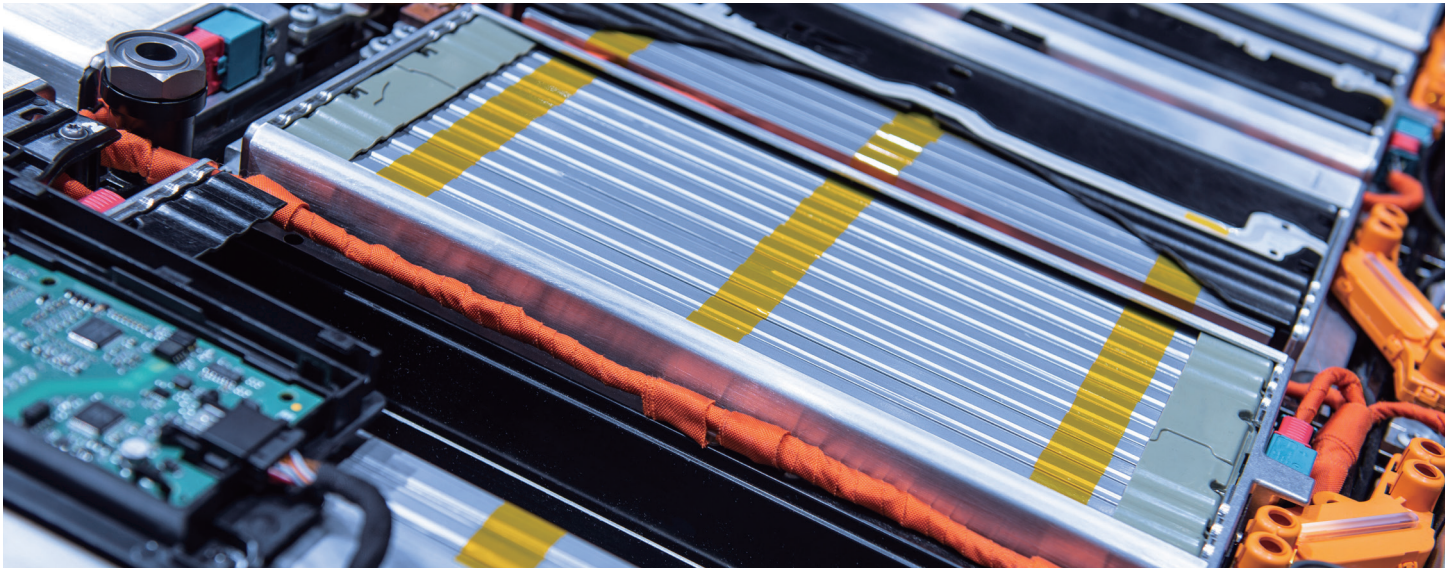




Thermal management – VORATRON™ Polyurethane Systems

Be sure to get your fill.

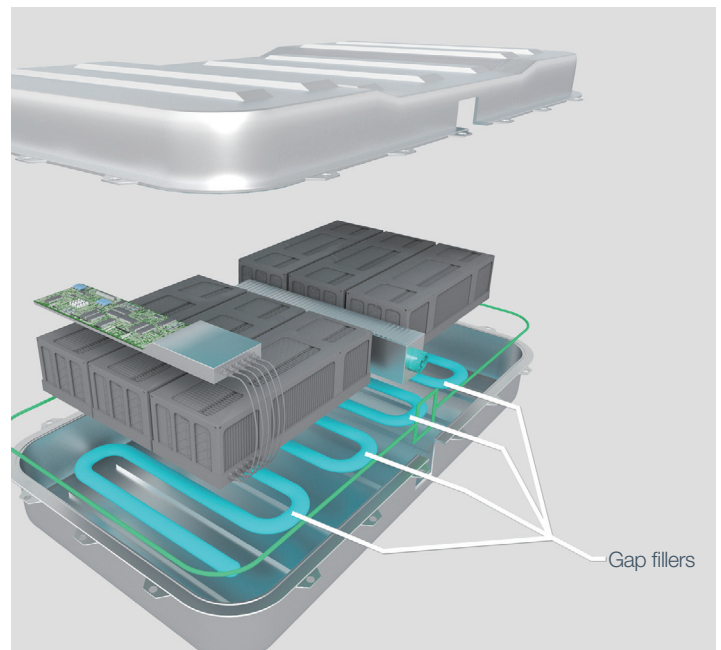


Virtually every hybrid/electric vehicle (H/EV) battery system uses some type of thermally conductive, polymeric gap filler to help attach the battery to its cooling plate. Now, as batteries become higher performing with increased energy density, demand for gap fillers that combine strong performance in the vehicle and on the assembly line is rising significantly.

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

VORATRON™ Systems for battery pack gap fillers

VORATRON™ GF-1000 and VORATRON™ GFA Series Polyurethane Systems are designed to offer the highest levels of gap filler performance alongside high quality battery assembly that combines fast, efficient application with safe handling and use. These two-part, room temperature cure materials also feature excellent thermal conductivity and enhanced elongation. Like all VORATRON™ products, their low density results in lighter weight materials, which help reduce battery and vehicle weights.



Excellent performance, processing and sustainability

Our primary formulation in this series, VORATRON™ GF-1002 Polyurethane System, is a 2-watt (2W) gap filler specially designed to enable low energy assembly of battery packs. This is accomplished via very low squeeze force levels at a displacement speed of 1 millimeter per second – the benchmark for low energy battery pack assembly. The material's shear thinning behavior with no self-leveling also supports easy dispensing and processing to help:

- Ensure complete module coverage
- Prevent excessive stress in finished parts
- Avoid air entrapment
- Minimize wear on equipment and battery modules

Table 1 highlights some important attributes of these materials.

Table 1: VORATRON™ GF-1000 Series systems for gap filling⁽¹⁾

Key attributes	Units	2W/mK	3W/mK
2-part, room temperature cure, low NCO, open time >30 min.	—	a	a
Squeeze force for low energy assembly	N	<120	<160
Density	g/mL	2	2.1
Rheology	—	Shear thinning, not self-leveling	
Hardness	—	75	75-85
Thermal conductivity	W/mK	2	3.1

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

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To support cell-to-pack design we are offering our VORATRON™ GFA Series which is designed to support low-medium adhesion on Aluminum and PET. With tuneable thermal conductivity, these options are designed to optimize heat management while offering the necessary level of stiffness and strengths for the pack.

Table 2: VORATRON™ GFA Series systems for CTP gap filling⁽¹⁾

Key attributes	Units	VORATRON™ GFA 1000 Series	VORATRON™ GFA 2000 Series
2-part, room temperature cure, low NCO, open time >30 min.	—	a	a
Thermal Conductivity	W/mK	1.5 – 2.0	1.5 – 2.0
Density	g/mL	1.9 – 2.0	1.9 – 2.0
Elongation	%	40 - 60	8 - 15
Lap Shear Strength (AL/AL)	MPa	0.5 – 2.0	2.0 – 4.0
Lap Shear Strength (PET/PET)	MPa	0.5 – 2.0	1.5 – 3.0

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 gap filler.

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