

Innovative Adhesive and Sealant Solutions

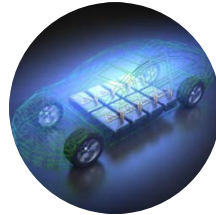
H.B. Fuller | Kömmerling Solutions for Automotive and Transportation Industry

Trends in Transportation Industries – Our Solutions



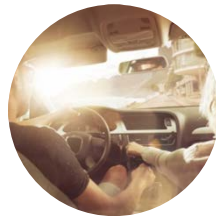
Lightweight Construction

- Cold curing elastic, semi-structural and structural adhesives for body structure and exterior trim applications
- Bonding agents



E-Mobility: Batteries

- Structural and elastic adhesives
- Thermally conductive adhesives
- Sealers
- Thermally conductive gap-fillers
- Encapsulations



Comfort and Functional Surfaces

- Adhesives for interior trim applications
- Cast resins for glass/plastic composites with integrated functions
- Sound damping with LASD and butyle patches



Electronic Systems

- Thermally conductive gap-fillers
- Encapsulation and coatings
- Structural/bonding adhesives
- Electrical insulation

E-Mobility: Battery Electric Vehicles (BEV)

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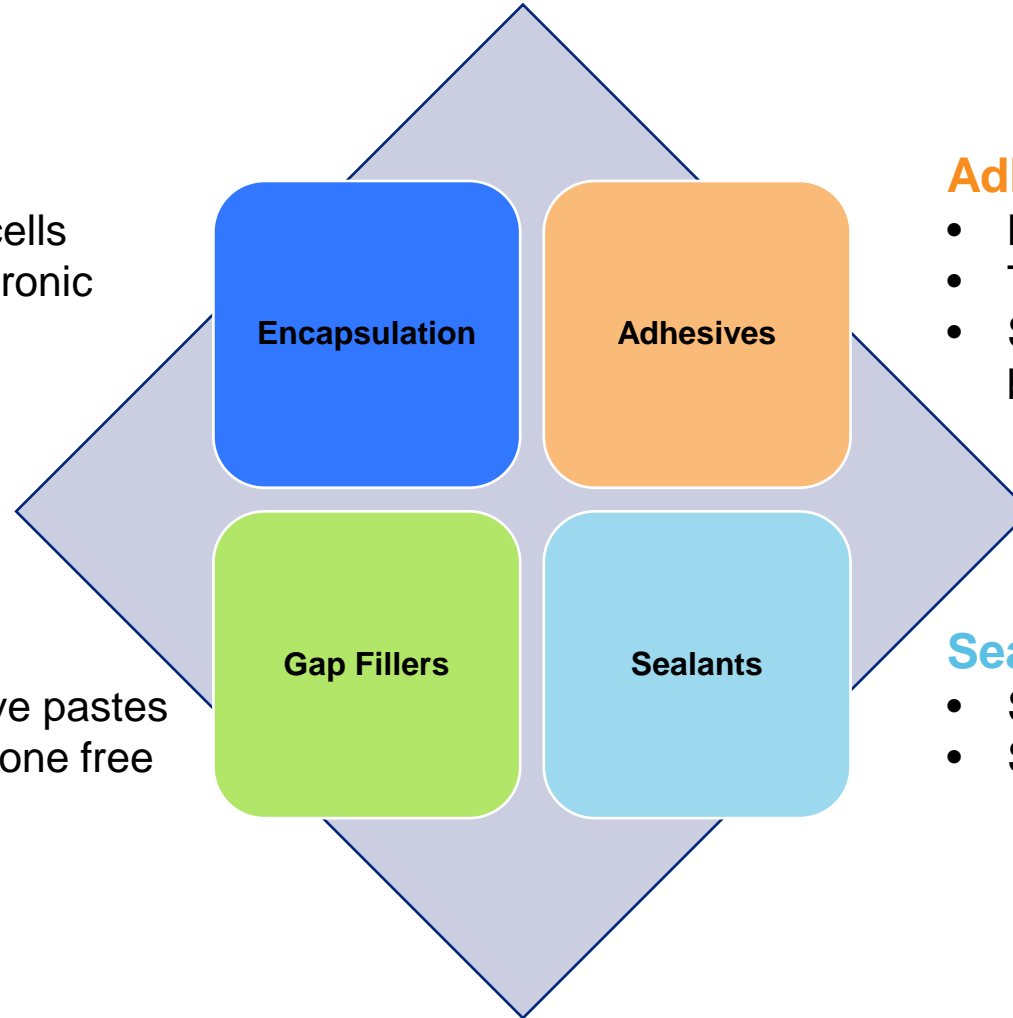
Battery-Applications H.B. Fuller | Kömmerling

Encapsulation

- Protection of the cells
- Protection of electronic components

Gap Fillers

- Thermal conductive pastes → MS-based, silicone free



Adhesives

- Module assembly → MMA / EP
- Thermally conductive adhesives → MS
- Structural adhesives for the frame of the battery box → PU

Sealants

- Sealing of the battery box → MS, butyle
- Sealing of the cover → MS, butyle

Adhesive Applications Batteries

Adhesives for Battery Packs

Module Assembly

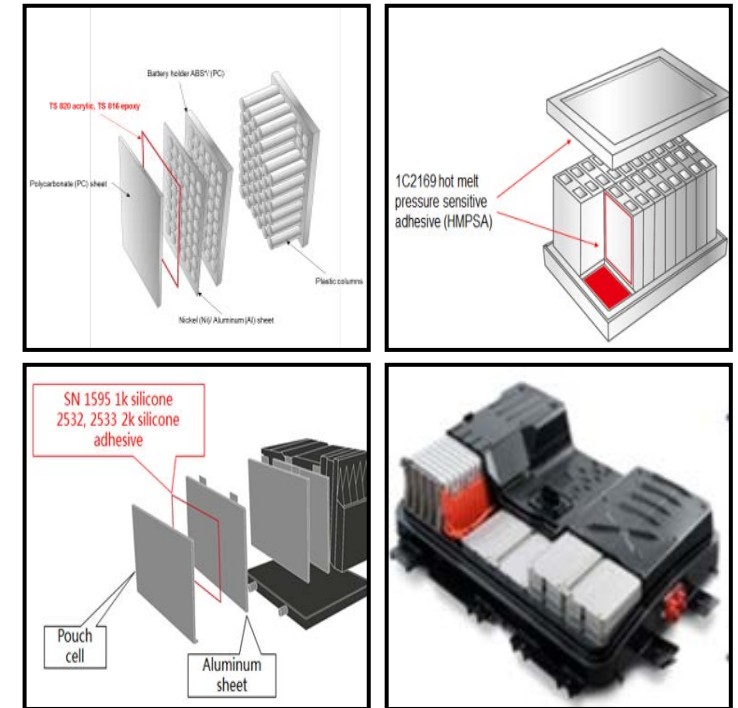
adhesive-systems for
cylindric, prismatic and
pouch-cells

Structural Adhesives

adhesive-systems for the
assembly of battery-
boxes, cooling plates and
covers

Thermally Conductive Adhesives

adhesives which support
the thermo-management
of the battery



Adhesive Applications Batteries: Structural Adhesives

Kömmerling High Modulus Structural Adhesives

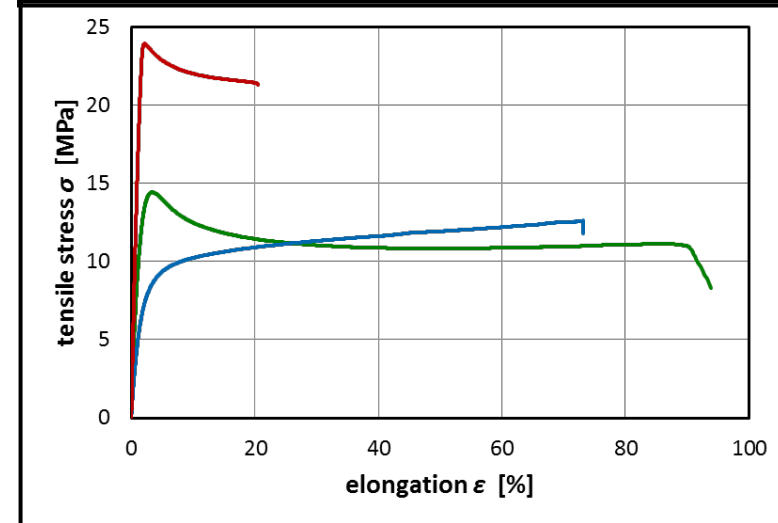
Properties:

- Room temperature curing ($\Delta\alpha$ problem)
- Tough failure at high strength values
- High fracture energy
- Adhesive strength adjustable to substrate strength
- High modulus
- Adjustable curing speed
- Adjustable rheology

→ **Tunable Toughened Adhesives (TTA)**

Adjustable Mechanical Properties:

Property	adjustable range
tensile strength	5 – 24 MPa
Young's modulus	500 – 1800 MPa
elongation at break	20 – 150 %



Adhesive Applications Batteries: Structural Adhesives

Property	Körapur 3005	Körapur 3008	Körapur 3020
Tensile strength σ_m	5 MPa	8 MPa	20 MPa
Young's modulus E_t	340 MPa	600 MPa	1600 MPa
Elongation at break ε_b	120 %	90 %	35 %
Tensile lap-shear strength τ_{max}	11 MPa	15 MPa	19 MPa
Shear modulus G_{10}	112 MPa	141 MPa	174 MPa
Shear strain at $\frac{\tau_{max}}{2} \tan(\gamma_f)$	200%	110 %	100 %



Sealing Applications Batteries

Sealants for Battery Packs

Sealing of Joints and Edges

elastic, MS-polymer sealants, applied in a flatsream-application

Sealing of Welding-Seams

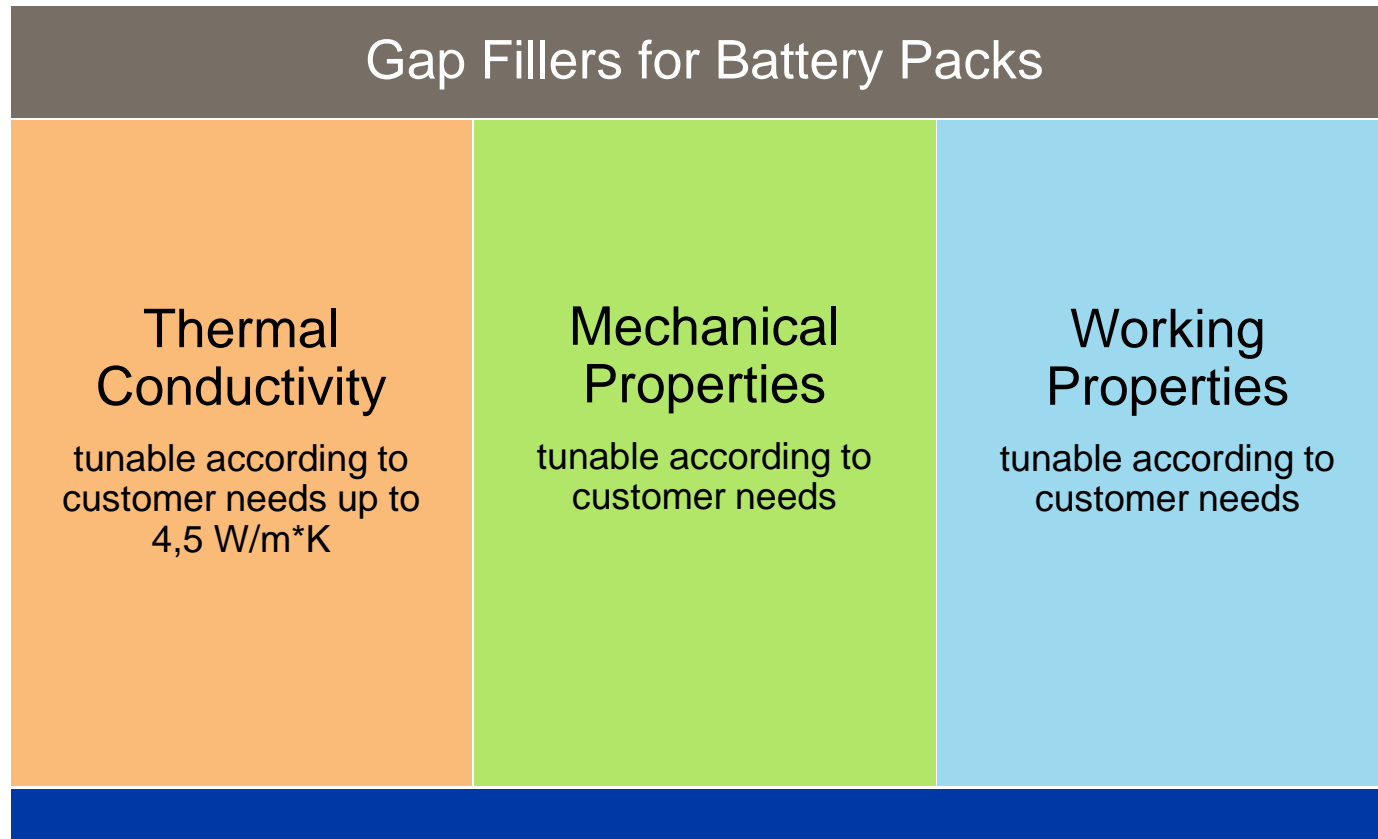
elastic, MS-polymer sealants, applied in a flatsream-application

Sealing of the Battery Cover

elastic MS-polymer or butyle-sealants



Thermally Conductive Gap-Fillers for Batteries



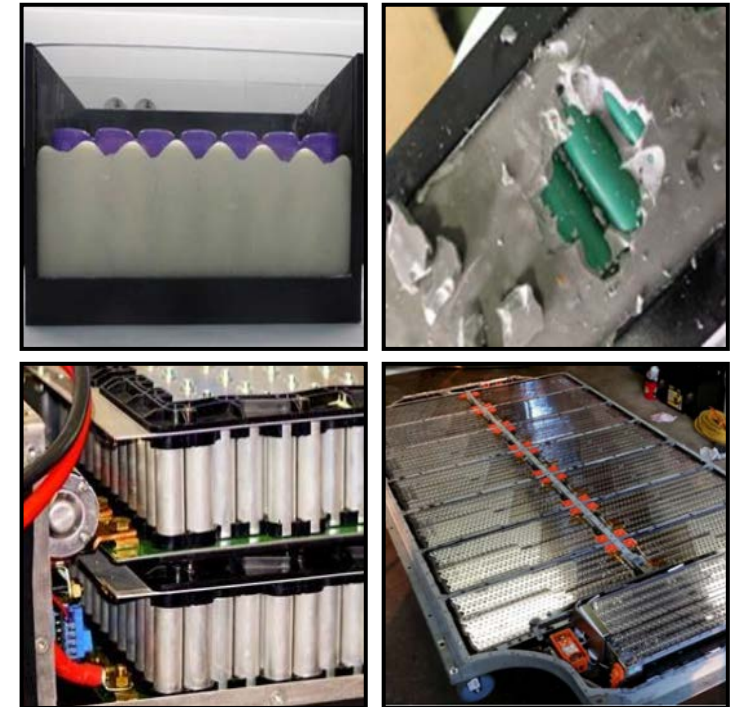
Encapsulation for Batteries

Cylindrical Cell Encapsulation

Properties:

- Applied liquid, reacts to a foam
- Low density
- Impact protection of the modules
- Flame retardant (meets UL 94-V0)
- Thermal runaway prevention

→ **Swiftbond 4006 FR**



Thank you!

