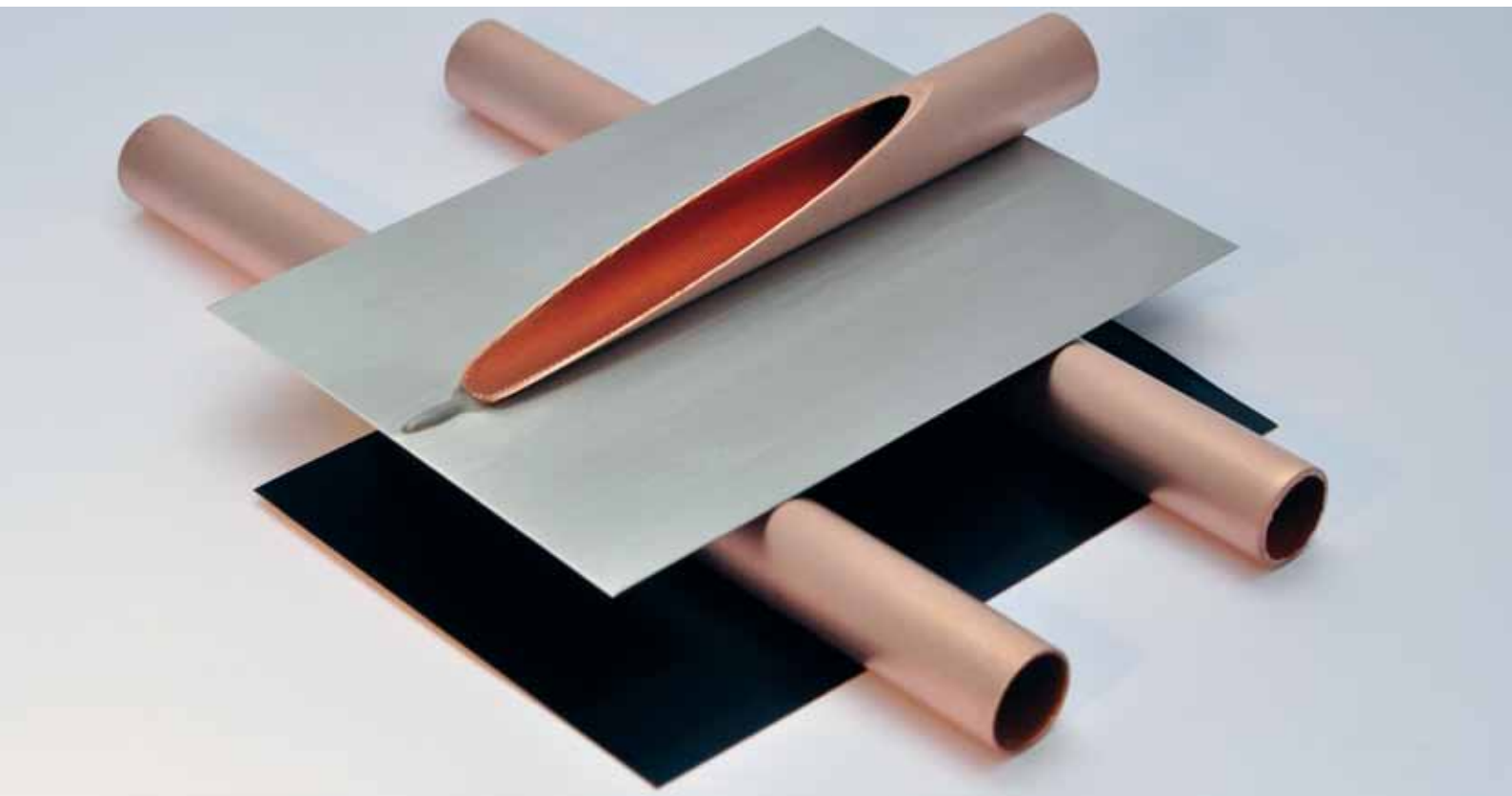


Adhesives for thermal management

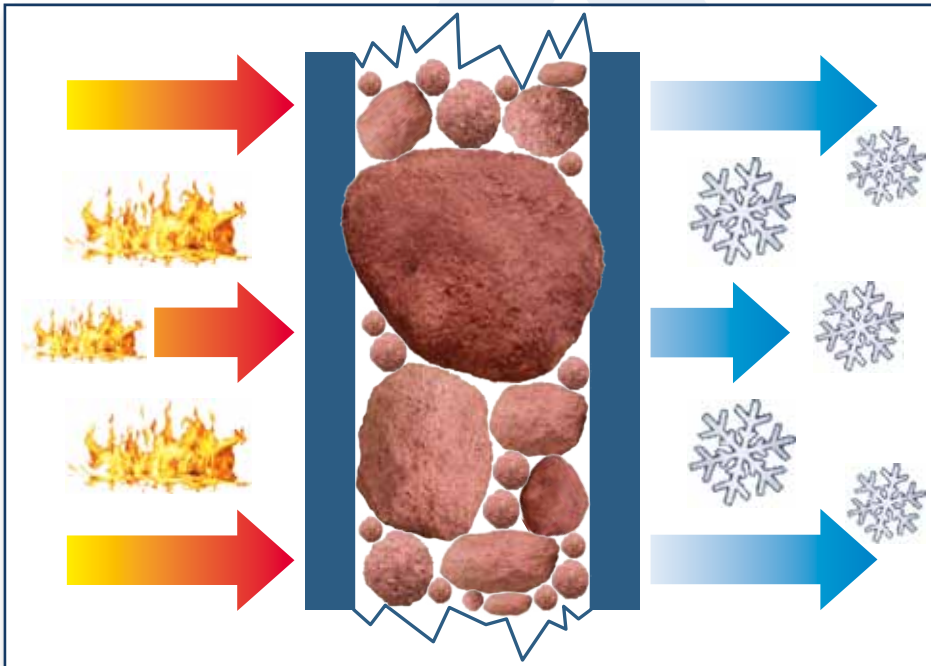


Solutions for thermal management

Based on metal and ceramic filled adhesives

- ▶ Thermal Interface Materials (TIMs) are in use for today's various applications. The dissipation of heat often creates a bottleneck for the performance of electronic devices, heat exchanger and solar panels.
- ▶ SoltaBond GmbH helps its customers to stretch such limits by:
- ▶ Development and production of TIMs, based on high performance adhesives which are tailored to the customer needs.
- ▶ Providing adhesives which are "production ready" and fit into the customers manufacturing process. Our adhesives can easily be processed in a variety of production processes.
- ▶ Technical support of customers by application training on the use of such sophisticated materials in mass production.

Thermal conductivity with metal filled adhesive



In applications where much heat needs to be dissipated the goal of the designer is to minimize the thermal resistance of bonds. So the natural idea is to use materials with good thermal conductivity. However this is not the full story. Real life is much more complex here.

Usually the bond line thicknesses generated are rather thin (<100µm) and engineers try to generate a bond line which is as thin as possible. However adhesives are complex systems. The thermal resistance depends on the adhesive's thermal conductivity at a given bond line thickness, the bond line thickness itself and other parameters like bonding pressure surface roughness, processing conditions (in particular cure), etc. Most thermally conductive adhesives have thermal conductivities in the range of 0,7 ... 4 W/m*K.

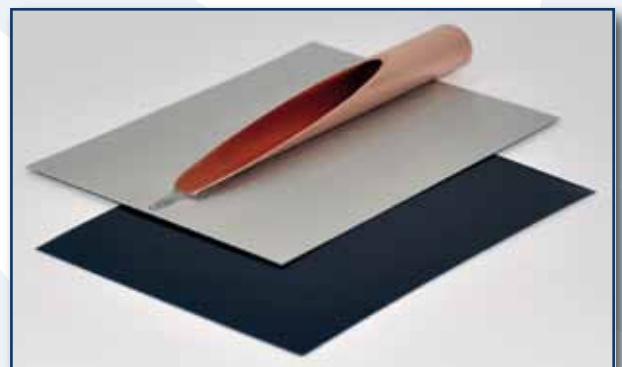
To get best thermal contact, it is key to clamp solid particles during bonding process in between the two surfaces. This process forms an intermetallic contact through the filler material. During adhesive cure this compression force is formed and supported by adhesive shrinkage and adapted bonding process. Because of high thermal conductivity of solid fillers like Al, Cu or Al₂O₃ itself, a low thermal resistance in between the two joined partners could be achieved.

SoltaBond SB2001



- ▶ Thermally conductive
- ▶ 2 component
- ▶ RT (room temperature) cure
- ▶ Applications: bonding of aluminum cooling elements, heat sinks, cooling coils of heat exchangers, etc.

SoltaBond SB2110



- ▶ Thermally conductive
- ▶ 1 component
- ▶ High temperature resistant, good for high ampacity requirements
- ▶ Applications: Graphite collecting rails, solar panels.

Thermally conductive adhesives

Adhesive series	Number of components	Filler	Thermal conductivity	Electrical conductivity	Cure temperature * ²	Operating temperature
SB23xx	2	Al (Aluminum)	1 – 230* ¹ W/m*K	poor	25 – 80 °C	150 °C
SB33xx	2	Cu (Copper)	1 – 400* ¹ W/m*K	good	25 – 80 °C	150 °C
SB53xx	2	Al ₂ O ₃ (Ceramic)	0,5 – 30* ¹ W/m*K	isolating	25 – 80 °C	150 °C
SB21xx	1	Al (Aluminum)	1 – 230* ¹ W/m*K	poor	120 – 200 °C	200 °C
SB31xx	1	Cu (Copper)	1 – 400* ¹ W/m*K	good	120 – 200 °C	200 °C
SB51xx	1	Al ₂ O ₃ (Ceramic)	0,5 – 30* ¹ W/m*K	isolating	120 – 200 °C	200 °C
SB32xx	2	Cu (Copper)	1 – 400* ¹ W/m*K	good	120 + 200 °C* ³	250 °C
SB12xx	2	Ag (Silver)	1 – 430* ¹ W/m*K	very good	120 – 200 °C	200 °C

*¹ Thermal conductivity of bare metal if filler particles are compressed in between join partner

*² The higher temperature, the faster cure occurs

*³ Multiple curing steps, each takes several hours

Applications

Thermally conductive adhesive for heat sink application



Our RT curing adhesives may be mixed in a static mixer system.

After cure it forms a flexible bond with low thermal resistance.

The operating temperature goes up to 150 C.

Its ultra low outgassing makes it often the material of choice to bond critical electronic and in particular optical components like LEDs.

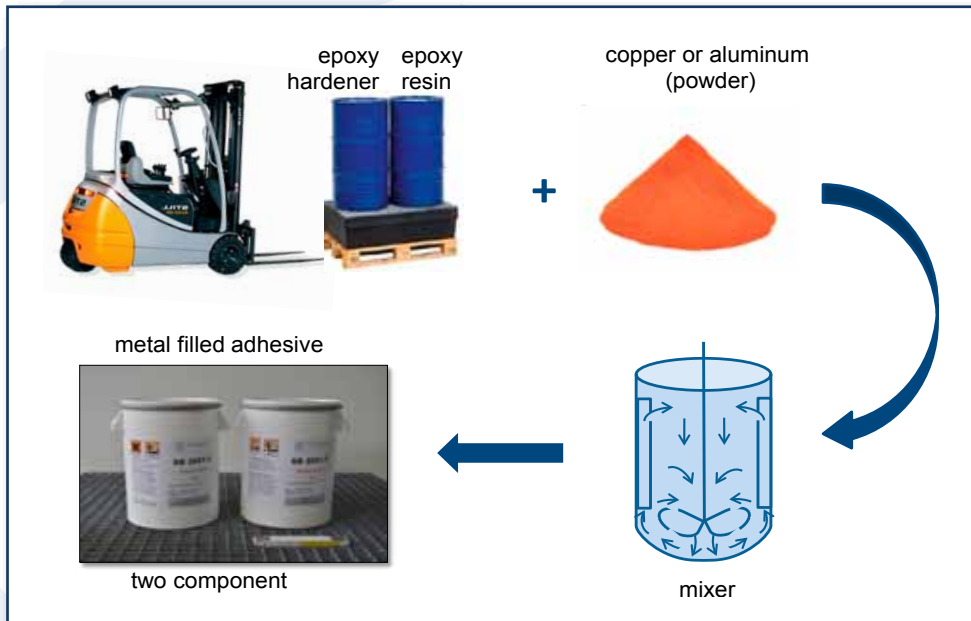
Ceramic filled adhesive dispensed with static mixer system

SoltaBond SB5102-4



SoltaBond SB5102-4 is a one component, heat curing, thermally conductive adhesive and potting material. It is a solvent-free, pasty epoxy material filled with aluminum oxide particles and has a long pot life. The adhesive has very good chemical resistance and thermal conductivity. It is especially suited for electrically insulating and thermally conductive bonds and encapsulations.

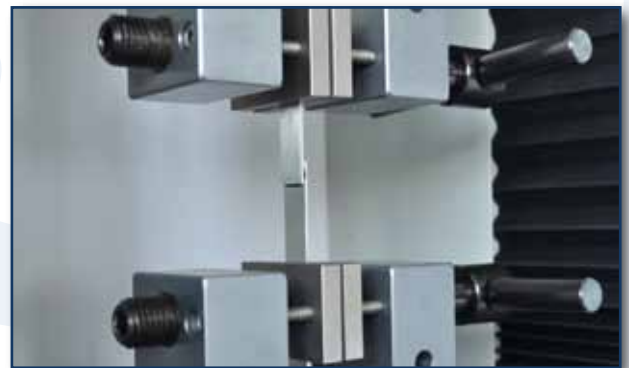
Manufacturing process



R & D activities



- ▶ Many of our materials were developed and/or modified in close cooperation with our customers and suppliers of processing machines. The adhesives not only must perform excellent in the final bond but also must be processable in mass production.



- ▶ We test adhesives on parts or components provided by our customers.
- ▶ In our state of the art laboratory we conduct test like e.g. damp heat, thermal shock, etc. following the guidelines of IEC, UL, etc.

Adhesive technology versus welding, brazing or soldering

- ▶ A wide range of different materials like e.g. different metals, exotic alloys, ceramics, plastics may be easily joined together by adhesives.
- ▶ Due to the low curing temperature of adhesives, there is no deformation or discoloration of components caused by local overheating.
- ▶ Adhesives are much more flexible compared to welds or soldered joints. This significantly reduces stress in glued structures and hence in general extends the lifetime of parts e.g. under thermal shock.

SoltaBond adhesives for high end applications

- ▶ All SoltaBond adhesives are based on high end epoxy resin formulations.
- ▶ Our products are solvent free and do not contain any toxic components.
- ▶ The adhesives are designed for use in industrial environments and are sold worldwide.
- ▶ Packaging of adhesives are designed for use in automatic mixing and dispensing machines.