Use of High Temperature Resistant Adhesives and Potting Compounds

High performance potting compounds are required for low heat generation and thus a long service life of components in the field of e-mobility. In the case of silicone-based materials, it is also important to minimize the proportion of volatile siloxanes through optimized formulations in order to avoid undesirable side effects.

In general, applications with high thermal stresses require materials that can withstand these extreme conditions – and without losing their properties. As a specialist for sealants and adhesives as well as potting and coating materials, Otto-Chemie offers several products under the Novasil brand along the component production in the field of e-mobility – especially for e-cars, e-bikes, batteries/accumulators, motors, transmissions and electronics – with which the sensitive electronic components are reliably protected against moisture, dust and dirt as well as mechanical stress (*Figure 1* and *Figure 2*). In addition, they can be used to fill cavities. Due to their elastic, water-repellent, fire-retardant and, in some cases, high temperature resistant properties, the special adhesives are also suitable for sealing housings, sensors or motors, according to Otto. "Wherever there are high thermal influences and everything still has to function permanently, our high temperature resistant adhesives and potting materials come into their own," says Holger Eschenmüller, Head of Business Devel-

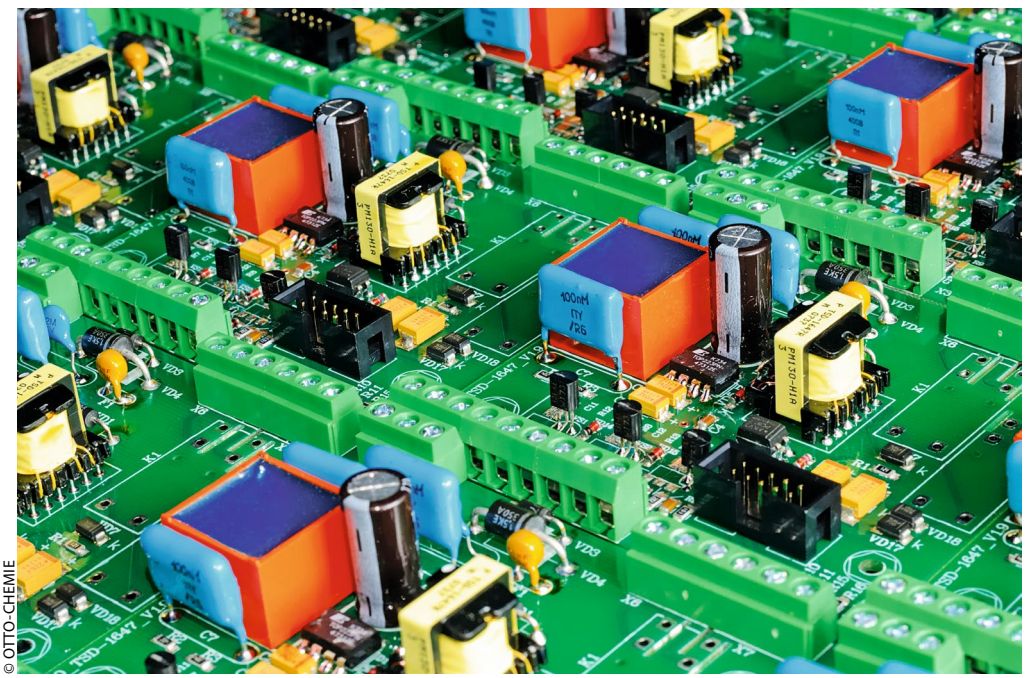

Figure 1 > For e-mobility applications, there are convincing reasons for potting components and assemblies: Potting protects sensitive components from moisture and dirt as well as vibrations and other mechanical stresses. At the same time, it can lead to an increase in performance if it dissipates heat or electrically insulates components. Another effect is the overall more compact design.

opment Industry at Otto, describing the range of applications for the special products.

High temperature resistant and non-corrosive

As electronic components become increasingly compact, temperatures of +180 °C and higher can occur at short notice both at the interfaces and in the component itself. With Novasil S 804, Otto has a low viscosity, high temperature resistant 1-component silicone encapsulant in its range, which has a permanent temperature resistance of +250 °C, is soft-elastic in its final state and is suitable for other fields of application due to its broad adhesion spectrum (*Figure 3*). The products Novasil S 805 and Novasil S 806 are also suitable for permanent high temperatures of up to +250 °C. Novasil S 805 is a neutrally curing 1-component high temperature silicone adhesive and sealant based on alkoxy that cures at room temperature. Due to its cross-linking system, the product is non-corrosive and therefore particularly suitable for applications in combination with various metals. In addition, the material adheres to numerous substrates even without a primer.
The neutral condensation curing 2-component high temperature silicone adhesive and sealant Novasil S 806 is suitable for permanently elastic bonding and sealing at temperatures up to +250 °C, adheres to many substrates without a primer and has a low odor. The material cures very quickly – even in thick layers – and exhibits low volume shrinkage during curing. In addition, the adhesive and sealant can absorb and minimize the stresses caused by vibrations or temperature fluctuations in the connection of housings or in the fixing of components.

Silicone encapsulants with UL94 V-0 certification

With the products Novasil S 651 and S 151 (*Figure 4*), Otto offers two 2-component silicone potting compounds that meet the high requirements of the strictest UL classification UL-V0. Due to its excellent flow properties, Novasil S 651 is suitable for potting electronic components as well as cables, sleeves and printed circuit boards. The product has a mixing ratio of 10:1, can be processed with all commercially available dispensing systems and cures at room temperature.

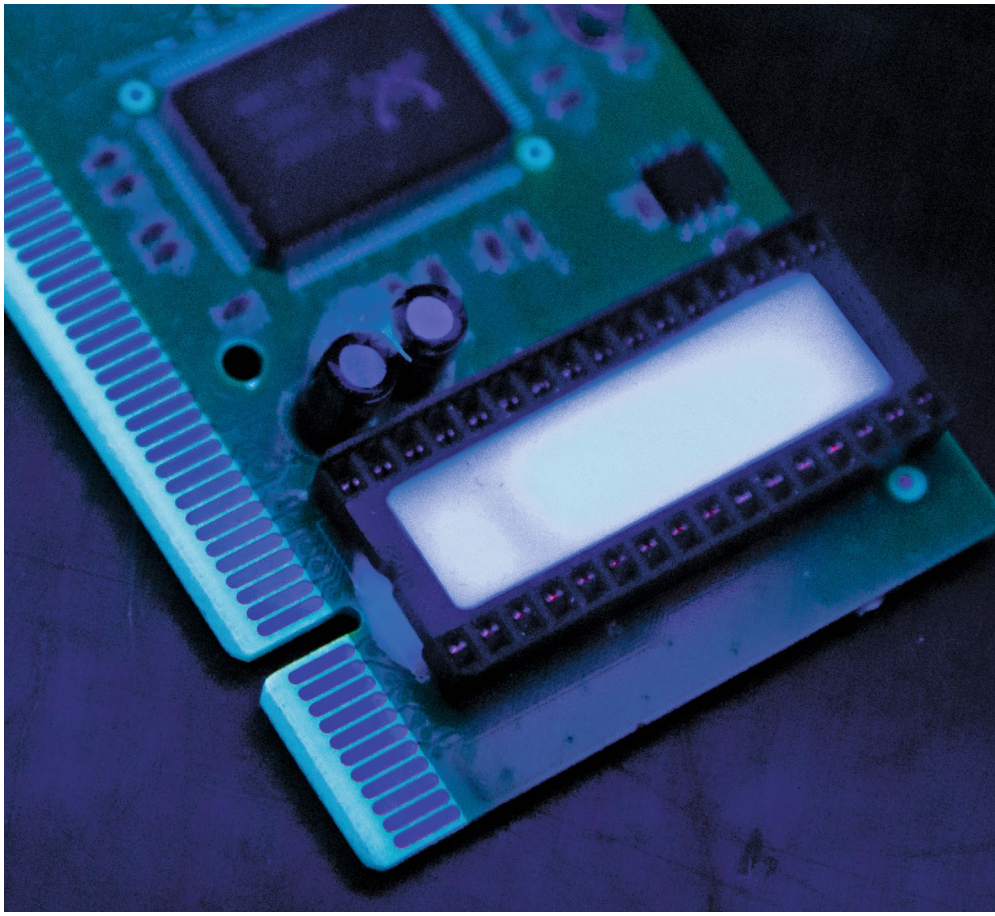

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Figure 2 > With the aid of UV indicators in potting materials, such as Novasil S 803, the material application can be controlled during the production process.

Novasil S 151 is a pasty, fast curing 2-component silicone encapsulant (mixing ratio 10:1), which is characterised by very low electrical conductivity and good thermal conductivity at the same time.

Efficient bonding, sealing and potting

Even if sealants and adhesives or potting materials only make up a comparatively small part of the overall product, their influence on perfect function is decisive. In addition, complaints are inevitable if the processing quality, performance and service life do not meet the expectations placed in them. Otto emphasises that this can be prevented by a well thought-out product concept that takes an unbiased look at all components. "So that the customer does not have to be satisfied with standard solutions, but rather receives the solution that best suits his materials and plant technology, we offer customer-spe-

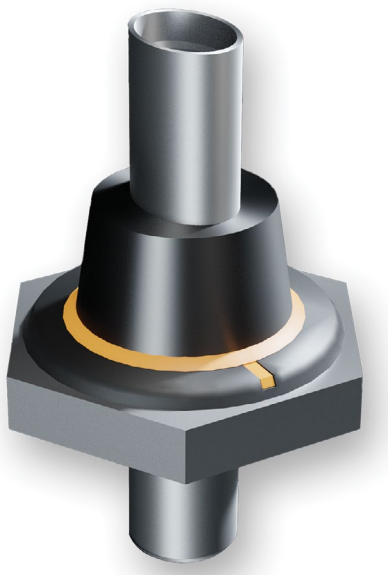

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Figure 3 > Application example engine connector: Thermally highly stressed components for automotive engine electronics can be manufactured with Novasil S 804. The adhesive and potting material can permanently withstand temperatures of up to 250 °C.

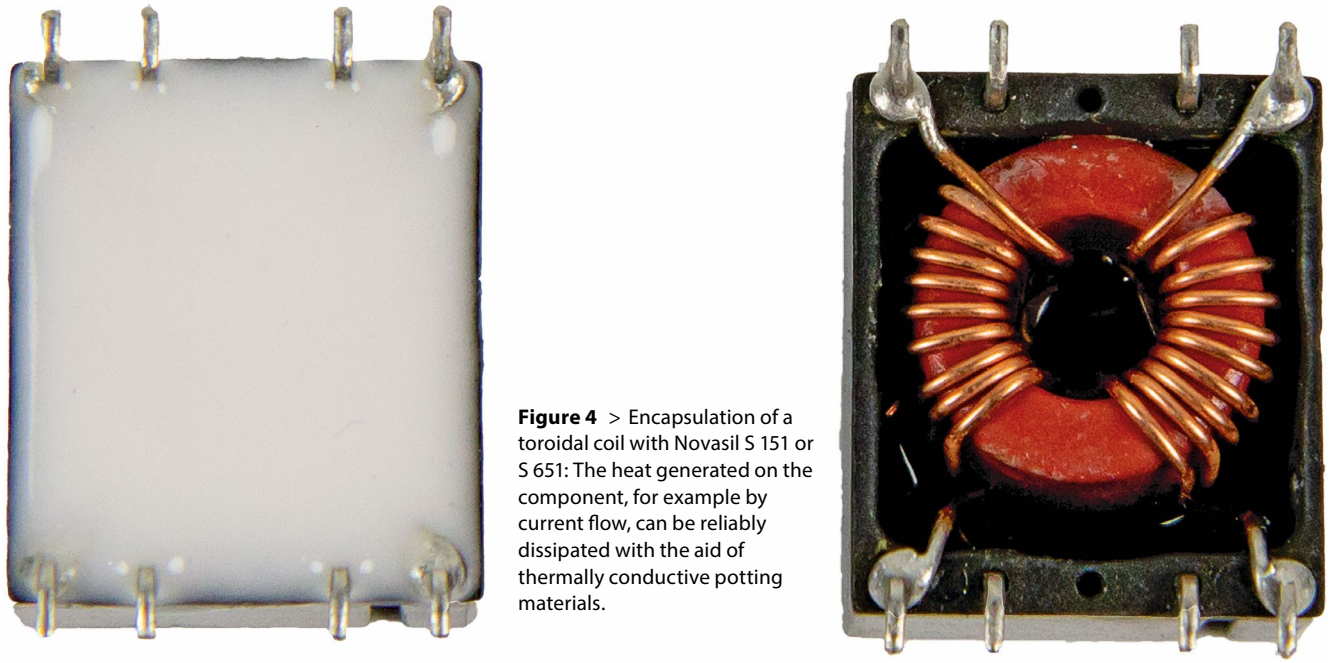

Figure 4 > Encapsulation of a toroidal coil with Novasil S 151 or S 651: The heat generated on the component, for example by current flow, can be reliably dissipated with the aid of thermally conductive potting materials.

cific product developments," says Eschenmüller.

Interaction of product and system technology

The first step is to define the basic requirements for the product. These include physical and chemical stresses, materials used, special features of the connection, aesthetic requirements and production processes. Then the exact solution that fits the project is assembled. In order to offer its market partners the highest possible safety in the use of sealants and adhesives, Otto proves the quality of its products under extreme conditions with elaborate tests in its own research laboratory. In addition, it is possible to individually adapt the adhesives, sealants, and potting compounds to the customer's production process in terms of reactivity and processing properties in order to ensure optimized, automated series production.

Mastering bonding speeds

In industrial production, it is primarily a matter of finding an acceptable level for the bonding speed, since high speeds in the bonding process must also be mastered by the customer in terms of process technology. In order for the process to run smoothly and without interruptions, it is essential that the system technology plays along. In the interest of a smooth production process, it is important to refrain from higher speeds in case of doubt. Against this background, extensive consulting is therefore also necessary as part of the development services.

Reduction of volatile siloxanes

The release of volatile siloxanes sometimes has undesirable effects, such as health effects due to VOCs (volatile organic compounds) or increased malfunctions of electronic components. For this reason, Otto says that in the formulation of its products it focuses on reducing the proportion of volatile siloxanes as far as possible, such as the cyclic variants with ring sizes between D3 and D9 (D: dimethyl cyclosiloxane).
"In general, our goal is to avoid contamination in electrotechnical applications by ensuring that the material to be vulcanized does not release a critical amount of volatile substances during the entire process – from dosing to curing," explains Holger Eschenmüller. "In doing so, Otto takes into account both the individual particularities of the customer-specific production process and those of the use of the finished products."
The company is now also specifically meeting the increased customer requirements by building up the product line of addition-curing silicones with its own production. Otto is currently investing a double-digit million amount in the expansion of production at the Fridolfing site as well as in the expansion of laboratory and development capacities and the sales structure. The aim is to fully produce and sell addition curing products from 2023. "In this context, we are already focusing on the reduction of volatile substances in the development of the product division in order to sensibly meet the requirements of the electronics industry," Eschenmüller sums up. //

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