Two-step bonding technique suitable for industrial use

Adhesive bonding technology is an effective way to seamlessly join two parts, even those made of different materials. However, because liquid adhesives need time to cure, they cannot be applied in every production step. Researchers at the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany, created a two-step method in which adhesive is deposited on one of the parts and then dried to form a non-sticky layer. During a subsequent step, the adhesive is hardened and parts are bonded together. The technique can be used to create a high-strength adhesive bond suitable for industrial use, which is not easy because the adhesives must fulfill different and sometimes contradictory requirements.

“Once the adhesive is applied, it can’t be tacky and it has to withstand long storage times,” explains chemical engineer Andreas Lühring. “It also has to be very reactive and harden quickly during joining.” The concept combines resins and hardening agents that melt at different temperatures.

The resulting hot melt adhesive can be used to manufacture fastening bolts, for example. The material is heated and applied to the fastener. After it cools, it solidifies again. The fastener can then be transported and stored. To harden the actual adhesive, it must be heated to more than 150°C in a controlled manner. In this way, two parts can be bonded to each other within seconds.

“There is one disadvantage to reactive adhesives like these. They can be stored for a long time, but not indefinitely,” says group manager Matthias Popp. To address this issue, a visual monitoring method was added—if the substance has lost its functionality, it changes color. These pre-applicable structural adhesives are also suitable for other applications, including a variable construction kit that offers adhesives based on different materials and hardening principles. The different compositions are tailored to yield the best productivity and characteristics for a wide variety of applications. www.fraunhofer.de.

New adhesive outperforms gecko feet

The ability to stick objects to a variety of surfaces such as drywall, wood, metal, and glass with a single adhesive has been the elusive goal of numerous researchers until now. A team from University of Massachusetts Amherst developed a new, more versatile version of their invention, Geckskin, which strongly adheres to a wider range of surfaces, yet releases easily like a gecko’s feet. Unlike other gecko-like materials, the invention does not rely on mimicking the nanoscopic hairs found on gecko feet, but instead builds on draping adhesion, which derives from the gecko’s integrated skin-tendon-bone system. The new ability was created by combining soft elastomers and ultra-stiff materials such as glass or carbon fiber fabrics. umass.edu.

UMass Amherst researchers compared three versions of Geckskin to the abilities of a living Tokay gecko on several surfaces. One exceeds the gecko’s performance on all tested surfaces.

Matthias Popp, Andreas Hartwig, and Andreas Lühring won a 2014 Joseph von Fraunhofer prize for their work on two-part bonding techniques. Courtesy of Dirk Mahler/Fraunhofer.

Plastic Omnium Auto Exteriors, France, is building a new facility to supply the Volkswagen plant in Chattanooga, Tenn., creating 300 jobs over the next three years. The automotive supplier is spending $65 million on the 27-acre facility, to be located next to the plant. Plastic Omnium has 110 plants in 30 countries, including 15 in North America. The company makes bumpers, fenders, and plastic body panels for car manufacturers around the world. plasticomnium.com.

Shiloh Industries Inc., Valley City, Ohio, a supplier of lightweighting, noise, and vibration solutions, signed an agreement with FinnvedenBulten AB to acquire 100% of the shares of Finnveden Metal Structures (FMS). With the $56.6 million acquisition, Shiloh adds stamping and magnesium die casting capabilities. Shiloh provides design, engineering, and manufacturing of engineered welded blanks, complex stampings, modular assemblies, and high-pressure aluminum die cast and machined components serving the body-in-white, chassis, emission, powertrain, structural, and seating needs of automotive OEM and Tier 1 customers. shiloh.com.

Liquidmetal Technologies Inc., Rancho Santa Margarita, Calif., signed an amended sublicense agreement with Visser Precision Cast LLC (VPC), Denver. Under the new agreement, Liquidmetal is freed from its commitment to use VPC as its exclusive contract manufacturer, and VPC is freed from its commitment to use Liquidmetal as its exclusive sales and R&D channel. Liquidmetal develops bulk alloys and composites that employ the performance advantages offered by amorphous alloys—unique materials that retain a random structure when they solidify. VPC offers amorphous casting, precision machining, and additive manufacturing (direct metal laser sintering) services. liquidmetal.com, visserprecisioncast.com.

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