

# New Process Technology for High-Tech Adhesives

Delo has developed an innovative new process technology called activation on the flow, which for the first time combines adhesive dispensing and preactivation of the adhesive in a single process step.

The process provides users with new options for designing their products and processes. At the same time, it can reduce costs and cut CO<sub>2</sub> emissions. The new technology is particularly suitable for bonding and encapsulating temperature-sensitive electronic components and offers an alternative to bonding processes previously used in industry.

According to the company, the unique feature of activation on the flow is that the adhesive is already irradiated during the dispensing process. This has the effect of starting the curing reaction even before the adhesive meets the component. After this combined process step, the components can be joined.

## Immediate initial strength

Another feature of the technology is that the exposed adhesive areas can be additionally irradiated and fixed after joining. According to Delo, this provides immediate initial strength, thus preventing the adhesive from flowing out and the components from slipping. The component can therefore be further processed immediately. With or without additional light fixation, the adhesive cures reliably to final strength without additional process steps, even in undercuts and shadowed areas. The adhesives developed specifically for activation on the flow are one-component epoxy resin-based products that contain two different initiators which react to different wavelengths and initiate curing. It is this dual-initiator system that makes the optional light fixation step possible. The adhesives are available with different mechanical properties and are highly resistant to media and temperature in the cured state, Delo reports.

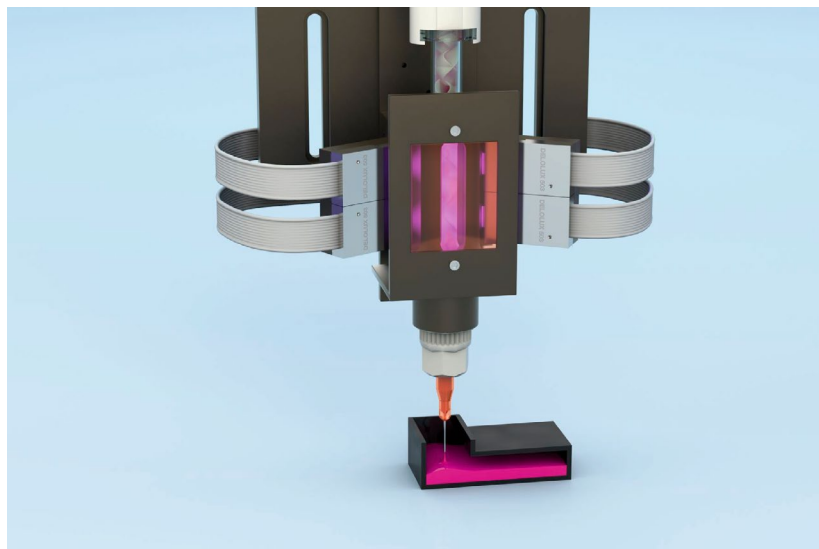
## Gentle and low-stress bonding of sensors and connectors

In addition to the process technology and the adhesive, Delo has also developed a corresponding device called Delo-Activitis 600, which is made up of two sub-units, one for dispensing and one for irradiation. Dispensing is performed on a volumetric basis, with the flow rate and quantity defined according to the process requirements. As the one-component adhesive passes through the mixing tube, it is irradiated by integrated curing lamps. The mixing coil ensures uniform activation of the entire adhesive volume. "With activation on the flow, we have developed a complete system that combines process technology, the adhesive, and the device, thus enabling innovations on the customer side," said Dr. Karl Bitzer, Head of Product Management at Delo. "The various customizable parameters open up completely new possibilities in terms of component design, efficient processes, and CO<sub>2</sub> reduction," Bitzer added.

Activation on the flow is particularly suitable for bonding and encapsulating temperature-sensitive components. For example, sensors and connectors can be bonded in a gentle way and with low stress using dual-initiator adhesives. None of the components need to be transmissive to light, and the adhesive cures reliably even in complex geometries.

As Delo points out, activation on the flow can replace various bonding processes that are widely used in industry. It is an efficient and environmentally friendly alternative to heat-curing, room-temperature-curing, or dual-curing processes and helps to overcome previous limitations, thus creating room for innovation. //

*For further information, please visit: [www.delo-adhesives.com](http://www.delo-adhesives.com)*



The new technology combines the process steps of dispensing and preactivation using light and provides innovative approaches to product design.

# Technologies for Improving Battery Production

Whether it is decarbonization, increasing electrification of transportation, or the expansion of renewable energies, the efficient and safe storage of energy plays a key role in the scenarios of the developing energy transition. Battery production is becoming a key technology, and no matter whether it involves manufacturing the smallest components or the largest energy storage solutions, highly specialized processes are used in every phase of battery production.

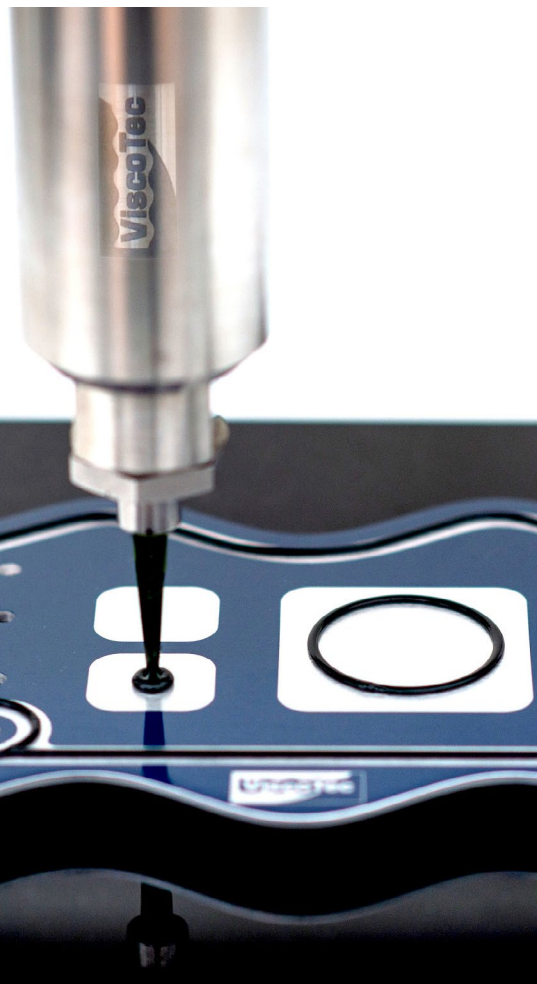
As a global supplier of precision metering and processing solutions for adhesives, coatings, polymers and plastics, sealants, and other materials, Nordson says that it can offer the technologies required at all stages of production from a single source, as well as the associated expertise in the field of thermally conductive materials, which benefit developers of electric vehicle batteries in particular. This complete integration of manufacturing pro-



From the smallest components to the largest energy storage solutions – Nordson provides technologies for every phase of the battery production process.

cesses not only improves product quality, but also optimizes production itself and maximizes its efficiency. As the company points out, more than 70 % of the glob-

al battery producers already belong to its customer base. // For further information, please visit: [www.nordson.com](http://www.nordson.com)



[www.viscotec.de](http://www.viscotec.de)



## PROCESS SAFE DISPENSING OF ADHESIVES AND SEALANTS

- Automated, reliable processes
- Regardless of viscosity
- Bubble-free and pulsation-free dispensing
- Precise results with 1- & 2-component materials
- Constant bead thickness with clean transitions

Solutions for emptying, treating and dispensing of difficult to handle fluids and pastes – for semiautomatic or fully automated production processes.

# Bandage with Integrated Medication

A bandage that releases medication as soon as an infection starts in a wound could treat injuries more efficiently. Scientists at Empa are currently working on polymer fibers that soften as soon as the environment heats up due to an infection, causing them to release antimicrobial drugs.



Visual inspection of the dressing material

It is not possible to tell from the outside whether a wound will heal without problems under the dressing or whether bacteria will penetrate the injured tissue and ignite an inflammation. To be on the safe side, disinfectant ointments or antibiotics are applied to the wound before the dressing. However, these preventive measures are not always necessary, which means that medications are wasted and wounds are over-treated.

To make matters worse, the wasteful use of antibiotics promotes the emergence of multi-resistant germs, which are an immense problem in global healthcare. Researchers at the two Empa laboratories "Biointerfaces" and "Biomimetic Membranes and Textiles" in St. Gallen now want to change this. They are developing a dressing that autonomously administers antibacterial drugs only when they are really needed.

## Development of a skin-compatible polymer composite

The idea put forward by the interdisciplinary team led by Qun Ren and Fei Pan is that the dressing itself should be "loaded" with drugs and also react to environmental stimuli. "In this way, wounds could be treated as needed at exactly the right moment," explains Fei Pan. As an environmental stimulus, the team chose a well-known effect: the rise in temperature in an infected, inflamed wound.

The team's job now was to design a material that would react appropriately to this increase in temperature. For this purpose, a skin-compatible polymer composite was developed made of several components: acrylic glass (polymethyl methacrylate, or PMMA), which is used, for example, for eyeglass lenses and in the textile industry, and Eudragit, a biocompatible polymer mixture that is used, for example, to coat pills. Electrospinning was used to process the polymer mixture into a fine membrane of nanofibers. Finally, octenidine was encapsulated in the nanofibers as a

medically active component. Octenidine is a disinfectant that acts quickly against bacteria, fungi, and some viruses. In health-care, it can be used on the skin, on mucous membranes, and for wound disinfection.

## Correct adjustment of the glass transition temperature

"To enable the membrane to act as a 'smart bandage' and actually release the disinfectant when the wound heats up due to an infection, we put together the polymer mixture of PMMA and Eudragit in such a way that we could adjust the glass transition temperature accordingly," said Empa researcher Fei Pan. The desired glass transition temperature of the polymer membrane was in the range of 37 °C. If inflammation occurs and the skin heats up above its normal temperature of 32 to 34 °C, the polymer changes from its solid to a softer state. In laboratory experiments, the team observed the disinfectant being released from the polymer at 37 °C, but not at 32 °C. Another advantage is that the process is reversible and can be repeated up to five times, as the process always "switches itself off" when it cools down. Following these promising initial tests, the Empa researchers now want to fine-tune the effect. Instead of a temperature range of 4 to 5 °C, the smart bandage should already switch on and off at smaller temperature differences.

## Smart and effective

Further laboratory experiments are now in the pipeline to investigate the efficacy of the nanofiber membranes against wound germs. Team leader Qun Ren has long been concerned with germs that nestle in the interface between surfaces and the environment, such as on a skin wound. "In this biological setting, which is a kind of no man's land between the body and the dressing material, bacteria find a perfect biological niche," says the Empa researcher. Infectious agents such as staphylococci or Pseudomonas bacteria can cause severe wound healing disorders. It was these wound germs that the team applied to the smart dressing in the Petri dish. It was found that the number of bacteria was reduced roughly 1000-fold when octenidine was released from the smart dressing.

"With octenidine, we have achieved a proof of principle for controlled drug release by an external stimulus," said Qun Ren. In the future, she said, the technology could be applied to other types of medication, thus increasing the efficiency and precision in their dosage. //

Contact and further information: Prof. Katharina Maniura, [katharina.maniura@empa.ch](mailto:katharina.maniura@empa.ch), [www.empa.ch](http://www.empa.ch)

# Quality Control within Milliseconds

Companies from the pharmaceutical, chemical, and food industries are dependent on meeting the highest quality while at the same time optimizing their production processes. Fraunhofer IAF and the Fraunhofer Center for Applied Photonics have now developed an integrable measuring system that can carry out non-contacting visual inspections within milliseconds.

With their inline-capable, laser-based infrared spectroscopy measuring system, researchers at the Fraunhofer Institute for Applied Solid State Physics IAF aim to support companies from the pharmaceutical, chemical, and food industries in making their quality control and process control measures more reliable and at the same time more efficient. The system has a flex-

ible design and high spectral scanning frequencies, enabling it to be integrated into existing quality control systems and providing full spectroscopic inspection.

The specific advantages of the system result from its use of a backscattering spectroscopy process in the mid-infrared range with wavelengths of 4 to 12  $\mu\text{m}$ . As molecular compounds in this spectral range have very characteristic absorption and emission lines, this “fingerprint” can be clearly identified.

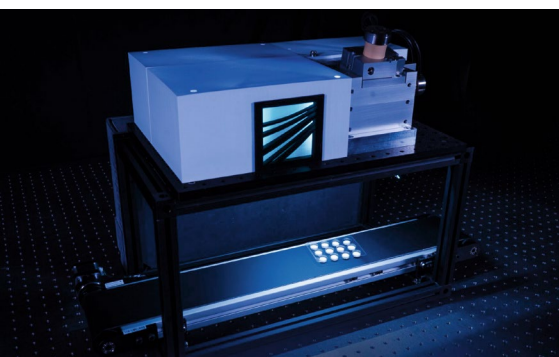
## Quantum cascade scanner combined with MOEMS

One of the core components of the measuring system is a broad-emitting and spectrally fast-scanning laser module. It combines the quantum cascade laser (QCL) from Fraunhofer IAF and the micro-opto-electro-mechanical grating scanners (MOEMS) from the Fraunhofer Institute for Photonic Microsystems IPMS. The

high brilliance of the light source and the unique properties of the MOEMS scanner enable high scan frequencies of up to 1 kHz. In the analysis of the measurement results, the system is supported by a neural network that reduces the fault rate and at the same time dramatically minimizes the measuring time.

To illustrate the measurement system’s ability to be integrated into industrial processes, the Fraunhofer IAF team has developed a practical demonstrator. A conveyor belt moves twelve identical-looking tablets in a common tablet blister package. The device recognizes the blister and the position of the individual tablets and scans the contents without contact in just 300 milliseconds. The results of the detection for each individual tablet are immediately displayed on the connected screen, so that contaminated or defectively loaded specimens can be removed. //

*For further information, please visit: [www.iaf.fraunhofer.de/en.html](http://www.iaf.fraunhofer.de/en.html)*



Demonstrator of the QCL-based measuring system

© Fraunhofer IAF

# A New Approach to Sustainable Production

Until recently, the concept of productivity has been defined in terms of financial targets. Now environmental, social, and regulatory goals need to be added to this definition. A study entitled “Sustainable Productivity” aims to give an overview of what this involves.

The industrial revolution resulted in an enormous increase in the efficiency of production processes. Everyday products can now be manufactured so cheaply that they are available to everyone. At the same time, this prosperity often results in the items hardly being used or discarded after just a short period. All of this has been made possible by efficient production processes.

Ongoing efforts to cut costs and improve efficiency have led to a capital- and resource-intensive approach to productivity. One obvious result of this is the rise in CO<sub>2</sub> emissions. The social and environmental impacts of this rate of growth have become increasingly clear in recent years. The worsening climate crisis in particular has caused a clear distinction to be made between the capital- and resource-intensive approach to productivity and the future scenario of a society that is much more environmentally conscious. Manufacturers in German-speaking countries must

begin the transition to sustainable production as soon as possible. As part of the transition, the concept of productivity needs to undergo fundamental revision on the basis of an integrated approach to sustainability. This is where the “Sustainable Productivity” study from the Laboratory for Machine Tools and Production Engineering (WZL) at RWTH Aachen University comes in. The aim of the study was to develop the necessary new understanding of productivity so that the manufacturing transition can begin. The study provides companies with practical recommendations for making their production processes sustainable. Alongside key figures for evaluating the current situation and the progress that is being made, it also describes examples of the successful transformation of manufacturing companies. //

*For further information, please visit: [www.wzl.rwth-aachen.de](http://www.wzl.rwth-aachen.de)*

# Reliable Bonding of Thermoplastics

Polyethylene and polypropylene, which are two of the most common thermoplastics, make up around half of all the plastics produced. Together with polyoxymethylene, these technical materials have one feature in common: they are all relatively difficult to bond. This challenge can be overcome with a range of ultra-modern adhesives that accommodate the different bonding properties of the materials.



Using the special adhesives from Ruderer, it is possible to bond PE, PP, and POM reliably and quickly with high-quality results.

Polyethylene (PE), polypropylene (PP), and polyoxymethylene (POM) are the plastics that are most widely used in industrial and commercial settings. These partially crystalline thermoplastics are saturated hydrocarbons that liquefy and become deformed when they are exposed to energy. As thermoplastics are very lightweight and robust and extremely strong and stiff, they are a popular all-round choice for manufacturing everything from food packaging and disposable medical equipment to injection molded parts, containers, seals, gearbox components, pipes, and fibers. However, because of the low surface energy and accompanying poor wettability of PE, PP, and POM, bonding these materials represents a significant challenge.

Because of the growing importance of plastics in the medical technology, electronics, packaging, construction, and automotive sectors, the adhesives company Ruderer Klebetechnik has added a range of new adhesives for thermoplastics to its product portfolio. Industrial and commercial users now have access to a series of specialist adhesives that produce high-strength structural bonds when joining PE, PP, and POM with one another and with other materials such as reinforced plastics, including CFRP and GFRP, metals, wood, and painted surfaces. The products developed under the Technicoll brand are two-component, solvent-based contact and hot melt systems.

## Designed for specific applications

As time-consuming and costly physical surface activation technologies, such as plasma activation or corona treatment, are not needed with the adhesives manufactured by Ruderer, users can save time, money, and resources when bonding PE, PP, and POM. The adhesives are formulated for specific uses and applications.

The new formulations enable small or large adhesive bonds to be produced simply and reliably with substrates such as PE, PP, and POM in assembly and repair work and in applications in indirect contact with foodstuffs. Users in the automotive industry and among its component suppliers also have available a range of high-performance adhesives for bonding injection molded parts. These products can also be used in the production of equipment and housings and for bonding sales display units and PE packaging and joining PE panels to wood in shop fitting applications.

## Non-hazardous in indirect contact with foods

The FDA-compliant hot melt adhesive Technicoll 9310 has been specially developed for adhesives that come into indirect contact with food. It can be used to bond food packaging, for instance, without pre-treatment. The raw materials in the adhesive meet the requirements of section 175.105 of the FDA regulations. This certification amounts to a letter of no objection for the adhesive, which means that it can be used with plastics that come into indirect contact with foodstuffs. As the hot melt is translucent and has good cold flexibility, it retains its full effectiveness in refrigeration units. It is also ideal for kitchen manufacturers, for example for producing wooden drawers with bonded PE cutlery inserts. The hot melt glue guns create spot bonds that are not harmful to health and increase the stability of the drawers.

## Reliable bonding of plastic panels and solar mats

Users should opt for the Technicoll 9110 adhesive for bonding entire plastic panels or other large surfaces. This contact adhesive has a high initial strength and a long open time. Apart from the cleaning the part to be bonded, no other surface pre-treatment is needed.

Gluing PE solar mats presents a particular challenge. The two-component Technicoll 9410-1 structural adhesive is formulated to adapt perfectly to the properties of the material. The four-minute processing period means that short cycle times are possible. In addition, the cured adhesive is highly resistant to weather, temperature fluctuations, impacts, noise, and vibrations. This two-component adhesive can also be used to bond injection molded parts made from PE, PP, and POM. //

For further information, please visit: [www.ruderer.de](http://www.ruderer.de)



# Lightweight and Strong Rotor Blades Using Adhesives

Germany's electricity supply is becoming more sustainable year by year. In 2019, more than 40 % of the average amount of electric power generated already came from renewable sources of energy – primarily from wind turbines. Exposed as they are to the forces of nature, these need to withstand all weather conditions. This is a challenge that can be met only by using state-of-the-art high-performance adhesives.



Renewable energy from wind turbines is one of the most important sources of electricity in Germany

Renewable energy resources are among the most important developments in Germany. As natural, inexhaustible sources of energy, they play a key role in the energy transition. According to the federal government's plans, their share of total electricity consumption is to rise to at least 80 % by the year 2050. Out in the open air, wind turbines are exposed to huge variations in temperature, as well as snow, rain, hail, and ultraviolet radiation. And if they are offshore, out in the open sea, they also have to withstand the effects of salt spray, growth of mussels and algae, and extreme, hurricane-like wind speeds of up to 70 m/s. The rotor blades, which are becoming bigger and bigger, therefore need to have

exceptional stability and, at the same time, they have to be light and flexible, as a rotor blade can deform by up to 20 meters at its tip when exposed to high wind speeds.

Rotor blades usually consist of two halves, which are joined using special high-performance adhesives, such as epoxy, polyurethane, or methacrylate adhesives. What is decisive first of all is the processing behavior of the adhesive. It must not flow away when being applied and must cure completely and quickly, while at the same time providing sufficient time for the mold to be closed correctly. The most important factor for a service life of 20 to 25 years with almost continuous operation under extreme conditions is static strength. When adhesive bonding is used for the joints, the materials are not weakened, as would otherwise be the case with drilled or stamped holes for screwing or riveting. As a result, no problematic stress peaks occur that might result in components tearing. In addition, adhesive bonds are not at risk of corrosion, which is particularly relevant for offshore wind parks. // *For further information, please visit: [www.klebstoffe.com](http://www.klebstoffe.com)*

## Save the Date: FEICA Conference and Expo, 14 – 16 September 2022

This year's European Adhesive & Sealant Conference and Expo will take place from 14 to 16 September 2022 at the Grand Elysée Hotel in Hamburg. As the organizer, FEICA (Association of the European Adhesive & Sealant Industry), which is also celebrating its 50<sup>th</sup> anniversary this year, is once again expecting more than 500 participants from the adhesive and sealant sector.

One main theme of the conference is "Enabling a sustainable future". The adhesive and sealant industry, which is committed to realizing its vision of sustainability, will play a key role in implementing the European Green Deal and a sustainable circular economy by collaborating in different sectors

and across value chains to support a shift in society to a more sustainable future. Against this background, FEICA 2022 will present a comprehensive overview of innovations, market trends, technological breakthroughs, research and development, new product and market applications, raw materials, new equipment technology, and the impact of new regulations on the industry.

The conference program will once again be supported by a parallel exhibition, which already has registrations from more than 20 companies. //

*Registration and further information:*  
[www.feica-conferences.com](http://www.feica-conferences.com)

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