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RESEARCH NEWS

11 | 2012 ||

1 Pressure switch inside the head

An increase in cerebral pressure may cause dementia and could destroy the brain. Companies have been seeking to find monitoring sensors that can be implanted into the brain, and read from outside the body. A tiny sensor may provide the help needed.

2 Quality products from rubber residues

Rubber residues can be downcycled to floor coverings and safety crashpads, and for the first time, also processed into high-quality plastics. A new kind of material makes it possible: the environmentally-friendly material mix is called EPMT.

3 Ultrasensitive photon hunter

When it comes to imaging, every single photon counts if there is barely any available light. This is the point where the latest technologies often reach their limits. Researchers have now developed a diode that can read photons faster than ever before.

4 Dealing with power outages more efficiently

When there is a power failure, the utility companies, public officials and emergency services must work together quickly. Researchers have created a new planning software product that enables all participants to be better prepared for emergency situations.

5 Looking for information?

Putting on a pair of novel data glasses with an OLED microdisplay allows you to see not only the real world, but also a wealth of virtual information. Imagine looking through a repair manual; the trick here is that you turn the pages using just your eyes.

6 Production of FRP components without release agents

Up to now, releasing components from molds has called for release agents. The problem is that the residues of these agents left behind must then be costly removed. Now, there is an alternative: a specially coated release film that leaves no residues.

7 The energy of stunt kites

It may seem as though the German plains are all but tapped out when it comes to wind energy production. To refute this theory researchers are sending stunt kites into the skies to harness the wind and convert the kinetic energy generated into electricity.

8 Newsflash

The Fraunhofer-Gesellschaft is the leading organization for applied research in Europe. Its research activities are conducted by 60 Fraunhofer Institutes at over 40 different locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of around 20,000, who work with an annual research budget totaling 1,8 billion euros. Roughly two thirds of this sum is generated through contract research on behalf of industry and publicly funded research projects. Branches in the USA and Asia serve to promote international cooperation.

Editorial Notes:

RESEARCH NEWS | Frequency: monthly | ISSN 09 48 - 83 83 | Published by Fraunhofer-Gesellschaft | Press Office | Hansastraße 27 | 80686 München | Phone +49 89 1205-1333 | presse@zv.fraunhofer.de | Editorial Staff: Franz Miller, Tim Schröder, Tobias Steinhäußer, Britta Widmann | Reprints free of charge.We encourage you to favor the online version and newsletter via www.fraunhofer.de/fhg/EN/press This bulletin is also available in German as FORSCHUNG KOMPAKT.

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Pressure switch inside the head

To this day it remains a mystery why the cerebral pressure in certain people suddenly increases. The consequences, however, are better understood: The blood circulation is disrupted and after a while parts of the brain may die off, similar to what occurs in a stroke. This is how dementia takes its insidious path. Experts estimate that up to ten percent of all cases of dementia in Europe can be attributed to rising blood pressure in the brain. Still, making the diagnosis is tough. People with a heightened susceptibility to a rise in intracranial pressure must be treated with intensive medical care today. A probe is inserted that goes from the outside through the skullcap to the brain. The cable keeps the patient connected to the measuring apparatus. Since cerebral pressure fluctuates, it takes extensive measurements in order to reach a definitive diagnosis of this disease. Patients therefore have to stay in hospital typically for several days, and sometimes even weeks.

Moisture corrodes predecessor prototypes

For some time now, medical device engineers have been working on an intracranial pressure probe that operates without a cable and can be read from the outside using radio wave transmission. But there is no established product on the market to this date for long-term implantation, because the sensors always have the same problem: Their casing – which previously had been produced primarily from biologically accepted synthetics – allows moisture to penetrate, which destroys the sensor in just a few days – or even hours. Researchers at the Fraunhofer Institute for Biomedical Engineering IBMT in St. Ingbert have now developed a small sensor that really stays waterproof. They had to give up the idea of encasing a sensor with synthetic materials. Instead, they produced the casing from high-grade metal. From the outside, the probe resembles a thick button cell battery. It is only about one centimeter high, two centimeters wide and in the future, should get even smaller. Resting on its inside is a pressure sensor made of silicon, similar to those sensors used today in automobiles, to handle the demanding measurement tasks.

"The cover of the tiny metal container is made from a pliable metal membrane that reacts to pressure changes in the brain," as project manager Dr. Thomas Velten, manager of the department of biomedical microsystems at IBMT, describes the unique aspects of the system. This pressure is transmitted to the silicon chip on the inside. The measurement value is transmitted to the measuring device outside the body through a radio impulse. "The benefits are immense," says Velten. "The patient no longer has to be checked in on an inpatient basis but comes to the clinic for a brief measurement appointment instead."

The sensor is read from the outside within seconds. It operates without batteries, since it is activated by the reading device. Thus, the patient can wear it for several months, or

even a number of years, without requiring additional surgery. During the Medica trade fair which takes place in Düsseldorf from November 14 to 17, 2012, researchers from IBMT will demonstrate how the sensor functions using a glass model head at the Fraunhofer joint exhibition stand in Hall 10, stand F05. "We will demonstrate the new kind of intracranial pressure sensor from the medical device technology industry, and seek to discuss it with other device manufacturers."

View of the not yet completely enclosed intracranial pressure sensor.
(© Fraunhofer IBMT) | Picture in color and printing quality: www.fraunhofer.de/press

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Quality products from rubber residues

Each year throughout the world, up to 22 million tons of rubber are processed and a large portion of it goes into the production of vehicle tires. Once the products reach the end of their useful life, they typically land in the incinerator. In the best case, the waste rubber is recycled into secondary products. Ground to powder, the rubber residues can be found, for example, in the floor coverings used at sports arenas and playgrounds, and in doormats. But until now, the appropriate techniques for producing high-quality materials from these recyclables did not exist. Researchers at the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT in Oberhausen recently succeeded in optimizing the recycling of rubber waste materials. They have developed a material that can be processed into high-quality products, like wheel and splashguard covers, handles, knobs and steerable castors.

The new plastic compounds are called elastomer powder modified thermoplastics or EPMT for short. They are comprised of rubber residues crushed into elastomer powder that are blended with thermoplastics. "In the first step, the rubber residues – that can be meter-long rubber pieces are granulated to three-millimeter large particles. The particles are cooled with liquid nitrogen and then ground into elastomeric powders. This is then conducted to the melt-mix process with thermoplastics and additives. Here we use, for example, polypropylene as a thermoplastic material," as Dr. Holger Wack, scientist at UMSICHT, explains the production process. Working jointly with his colleagues Damian Hintemann and Nina Kloster, the trio collaborates on the "EXIST Research Transfer" project sponsored by the Federal Ministry for Economics and Technology BMWi, where they work meticulously on various recipes for new blends of materials that are already protected by patent and trademark rights.

Variable material properties

The compound stands out from a number of different perspectives: The crushing of rubber waste is more environmentally-friendly and resource-efficient than producing new rubber products – an important aspect in view of the rising costs of energy and raw materials. "EPMT may contain up to 80 percent residual rubber; only 20 percent is made up by the thermoplastics," says Wack. EPMT can be easily processed in injection molding and extrusion machines, and in turn, these products are themselves recyclable. The clou: The physical and mechanical material properties of the substance – like elasticity, breaking strain and hardness – can be individually modified, according to the customer's wishes.

Altogether, three basic recipes have been developed that collectively can be processed on the large technical production machines. The researchers are capable of producing 100 to 350 kilograms of EPMT per hour. Spurred on by this success, Wack and both of his colleagues founded Ruhr Compounds GmbH. In addition to the production and the

sale of EPMT materials, this Fraunhofer spin-off offers custom-made service packages: "We determine which of the customer's materials can be replaced by EPMT, develop customized recipes and also take into account the settings required at our customers' industrial facilities," says the scientist. The widest array of industries will benefit from the expertise of these professionals: processors of thermoplastic elastomers can obtain EPMT and further process it into products. Industrial companies whose work involves elastomers – such as the industrial and construction sectors, or car-makers and athletics – could recycle these products, make EPMT from them, incorporate them into their existing products and thereby close the materials cycle.

Nike tests EPMT

In the "Re-use a Shoe" project, sports gear maker Nike has been collecting used sneakers for a while now, recycled their soles and under the label "Nike Grind", reprocessed them as filler material for sports arenas and running track surfaces. The EPMT compound of the Fraunhofer researchers enables Nike to place new products on the market. As one of its official promotional partners, "Tim Green Gifts" created the first EPMT-based promotional articles under the "Nike Grind" brand, like frisbees, shoehorns and boomerangs. Discussions about using new EPMT compounds in the original portfolio, such as zippers, bag bases and sports equipment, have also been initiated. "We are extremely excited about this collaboration," says Wack.

Elastomeric powders can be used in a variety of ways in high-quality materials.
(© Fraunhofer UMSICHT) | Picture in color and printing quality: www.fraunhofer.de/press

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Ultrasensitive photon hunter

Fast and ultrasensitive optical systems are gaining increasing significance and are being used in a diverse range of applications, for example, in imaging procedures in the fields of medicine and biology, in astronomy and in safety engineering for the automotive industry. Frequently the challenge lies in being able to record high-quality images under extremely low light conditions. Modern photo detectors for image capture typically reach their limits here. They frequently work with light-sensitive electronic components that are based on CMOS (Complementary Metal Oxide Semiconductor) or CCD (Charge-Coupled Device) image sensors. The problem is that neither the latest CMOS nor CCD systems can simultaneously guarantee a swift and highly-sensitive high quality image recording if there is a paucity of photons to read.

In cooperation with the partners of the MiSPiA project consortium the Fraunhofer Institute for Microelectronic Circuits and Systems IMS in Duisburg has now advanced the development of CMOS technology and introduced an ultrasensitive image sensor with this technology, based on Single Photon Avalanche Photodiodes (SPAD). Its pixel structure can count individual photons within a few picoseconds, and is therefore a thousand times faster than comparable models. Since each individual photon is taken into consideration camera images are also possible with extremely weak light sources.

Camera installed directly on chip

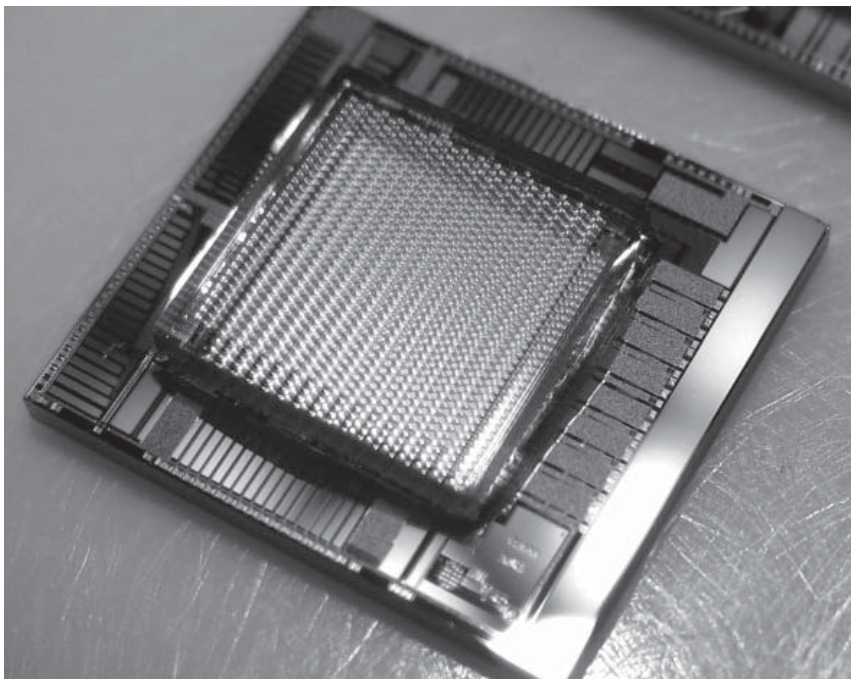
To achieve this the new image sensor uses the "internal avalanche breakdown effect"– a photoelectric amplification effect. The number of "avalanche breakdowns" corresponds to the number of photons that the pixels hit. In order to count these events, each of the sensor's pixels comes with very precise digital counters. At the same time, the scientists have applied microlenses to each sensor chip, which focus the incoming beam in each pixel onto the photoactive surface. Another advantage is that processing the digital image signals is already possible directly on the microchip; therefore, additional analogue signal processing is no longer needed.

"The image sensor is a major step toward digital image generation and image processing. It allows us to have the capability to use even very weak light sources for photography. The new technology installs the camera directly on the semiconductor, and is capable of turning the information from the light into images at a significantly faster pace," states Dr. Daniel Durini, group manager for optical components at the Fraunhofer Institute IMS.

IMS engineered the sensor under the European research project MiSPiA (Microelectronic Single-Photon 3D Imaging Arrays for low-light high-speed Safety and Security Applications). Altogether, seven partners throughout Europe from the fields of research and business are involved in the project. In the next stage, the scientists from Duisburg

are working on a process to produce sensors that are back-lighted, and in this regard, even more powerful. At the same time, the new technology is already being utilized in tests for traffic. Chip-based mini-cameras protect vehicles, bicycles and pedestrians from collisions and chip-based accidents, or assist in the reliable functioning of safety belts and airbags.

The Fraunhofer Institute IMS will exhibit the new image sensor at "Vision" – the world's leading trade show for image processing – from November 6 to 8, 2012 in Stuttgart at stand H74 in Hall 1.



It is now possible to process digital image signals directly on the microchip. (© Fraunhofer IMS) | Picture in color and printing quality: www.fraunhofer.de/press

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Dealing with power outages more efficiently

Power supply is the backbone of our modern economy. Nearly every aspect of life depends on electrically-operated devices. When the flow of power stops, it is not just the lights that go out. In the supermarket, the automatic teller machines and cash registers stop working. Even telephones, radios and televisions become paralyzed. If the shortage lasts a long time the supply of hot water, gas and fuel and the functioning of respirators at intensive care units in nursing homes or at private homes is at risk.

The causes of this dreadful scenario can range from natural disasters to terrorist attacks or just technical problems. A few recent examples demonstrate how real the risk is in Germany where the last major event occurred in Hannover in 2011. The 650,000 people there went without power for up to 90 minutes after a blockage in a coal-fired power plant, and the power main connection at a transformer station failed. Even more far-reaching consequences were seen from the biggest power outage in post-war history, when extreme snowfalls in the Münsterland region in 2005 knocked out a series of high-voltage pylons. Some 250,000 people went without power, in some cases for up to five days. The financial damages exceeded 100 million euros.

Firefighters as process managers

In emergency cases, the utility companies, public officials and emergency services realize that they must contend with a variety of tasks: Who are the most seriously affected? Where is greatest need for action? How long will emergency power supply last? Who travels where, and how long will the fuel last? Theseare just a fraction of the issues that require rapid response. "To minimize the duration of the crash, the officers-in-charge at the fire, police and emergency services departments have to act like process managers," explains Dr. Thomas Rose, head of the Risk Management and Decision Support research department at the Fraunhofer Institute for Applied Information Technology FIT in St. Augustin.

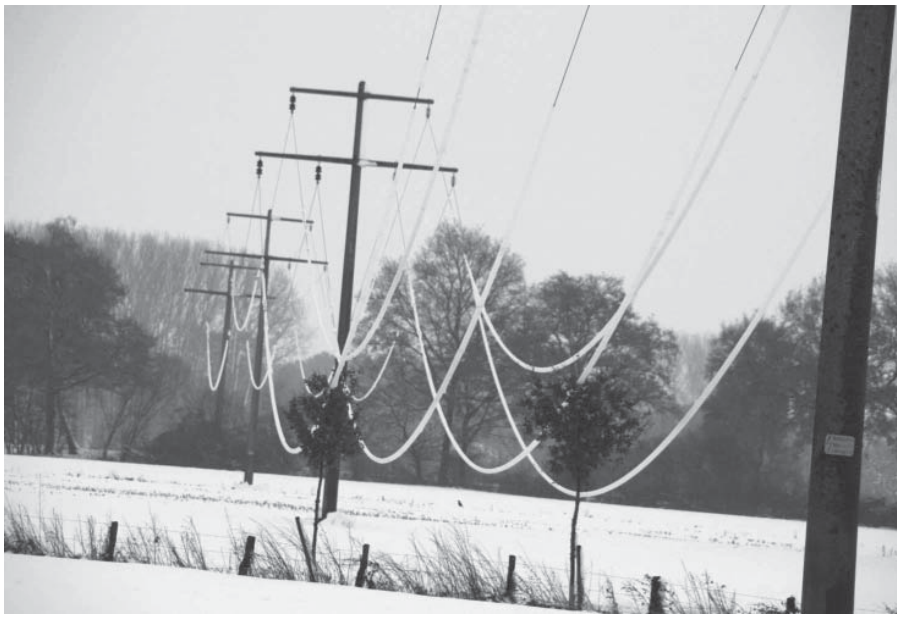
Whereas process managers at companies have access to specialized software tools, rescue personnel have no modern IT-backed process management tools available for crisis situations. "Currently available solutions for industry and business are too complex, and do not fit the unique requirements that the police, the fire department and other emergency services have. Even programs like Excel rapidly hit their limits when there are constantly changing volumes of data. This is precisely the gap our IT safety platform covers," explains Rose.

The software from the Fraunhofer Institute FIT provides energy suppliers, public officials and rescue professionals throughout Germany with the opportunity to be prepared in advance – in other words, before the power goes out – for optimal joint collaboration in crisis situations. At the heart of this IT solution, developed under the auspices of the

InfoStrom research project, are role-based checklists. These contain not only detailed action guidelines on what each individual site has to do, but also guidelines on which items have to be coordinated with other sites.

Tests in two local counties

For example, the technical relief organization knows exactly how many vehicles the local fire department plans to deploy. "Checklists are ideally suited for crisis management. But previously, they were only available on paper. Even the cross-organizational approach was missing. In addition, we integrated a glossary. Because different rescue personnel typically use different sets of terminology," says Rose. The operational capability of the software was successfully evaluated in the more urban-defined Rhein-Erft county, and the more rural setting of Siegen-Wittgenstein county.



Black ice can be an immense burden on the power grid. The power lines sag low enough to almost touch the ground. (© Fraunhofer FIT) | Picture in color and printing quality: www.fraunhofer.de/press

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Looking for information?

Up to now, mechanics carrying out complex repairs relied mostly on information from handbooks to guide them. But leafing through books tended to break concentration and repairs took longer. This situation is by no means improved by using PCs or laptops to call up the information; mechanics still need to click their way through page after page to find what they need. Another disadvantage is that tools have to be put to one side in order to deal with the book or computer. Researchers at the Fraunhofer Center for Organics, Materials and Electronic Devices Dresden COMEDD have been working for several years designing interactive HMDs – Head Mounted Displays – based on OLED technology for just such applications. These displays offer access to what is known as "augmented reality", enhancing the real world with additional visual information. Navi-gating through this augmented reality used to require data gloves or a joystick. Now COMEDD scientists, working together with their colleagues from the Fraunhofer Institute for Optronics, System Technologies and Image Exploitation IOSB in Karlsruhe and near-the-eye technologies specialist TRIVISIO, have succeeded in developing data glasses fitted with displays that can be controlled by the movements of the human eye. Mechanics wearing such glasses are able to assess the damage while also using their eyes to turn the pages of the virtual instruction manual. The system will be on display at the joint Fraunhofer booth in Hall A5, Booth 121, at the electronica trade fair in Munich, from November 13–16.

Photodiode detects eye movements

"We've fitted our glasses with a novel CMOS chip with an integrated camera and OLED microdisplay, for which we also hold the patent," explains project manager Dr. Rigo Herold. This is the first time that researchers have integrated OLEDs together with photodetectors onto the surface of the CMOS chip. "The chip is equipped with micro-scaled transmitter and receiver units that configure the pieces of information sequentially; we call this an array structure. This gives us a bidirectional microdisplay, making it possible both to record and to reproduce images," says Herold. The chip measures 11 by 13 millimeters and contains four OLED pixels as well as a photodiode in the center that detects the wearer's eye movements. The pixels are responsible for rendering the images that appear on the microdisplay. The display itself is made up of an interleaved matrix of OLED pixels, embedded into which are photodetectors that function as a kind of camera, and has a light field measuring 10.24 by 7.68 millimeters. Looking through the glasses as if at the horizon, viewers see anything from an assembly drawing to a map projected apparently at a size of up to one meter some distance before them.

"Here we have a completely new generation of personal information management systems," says Herold. "The data glasses allow us to see the real world in the normal way, while at the same time registering our eye movements with the camera. One glance at the arrow key turns the page. Despite the fact that Google's data glasses, for

instance, might be a little more stylish in appearance, navigating through the menu still requires using joysticks, whereas our glasses do not." Be they technicians or doctors, all users have their hands free and can concentrate fully on the task in hand.

Researchers will present the system in the form of an Evaluation Kit at the electronica trade fair. The kit contains the glasses as well as the corresponding hardware and software. These last were developed by colleagues at Fraunhofer IOSB, while the eyewear itself was produced by TRIVISIO. The system can run on both LINUX and Windows. Buyers have the option of ordering a computer with the system or buying the software by itself and installing it on their own computer.

As the Society for Information Display celebrated its 50th anniversary, Fraunhofer researchers celebrated winning the Best in Show Award at the world's most important display conference, the SID Display Week, held in Boston, MA in June this year. Those first in line from manufacturing, industry, medical and security sectors are currently exploring possible applications of this new technology.

Users can control the display of these data glasses with their eye movements. (© Fraunhofer COMEDD) | Picture in color and printing quality: www.fraunhofer.de/press

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Production of FRP components without release agents

If you want to bake a cake, you have to grease the baking pan beforehand; otherwise the cake will stick to it. Making fiber reinforced plastic components (FRP components) is much the same: release agents are wiped or sprayed onto the surface of the mold so that the component can be taken out once it was cured. However, this approach leaves behind residues of release agents on both the component and the mold. Component surfaces must usually then be manually cleaned – a painstaking and potentially critical process, since removing too much material has a negative impact on component quality. Molds, too, must be regularly cleaned – but the downtime entails a not insignificant price. Now, the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM has developed a release film that renders these cleaning tasks. "Our film can be applied to structures of all kinds and makes it easy to release components from molds," says Dr. Matthias Ott, project manager in the Plasma Technology and Surfaces PLATO section. "It features a 0.3 micrometer thick plasma-polymer release layer that leaves no residues on the surface of the component."

This coating on the film is based on development work conducted at the IFAM on producing non-stick component molds using a low-pressure plasma process. First, the mold to be coated is placed in a plasma reactor and atmospheric pressure is reduced to one 10,000th. Next, layering gases are fed into the reactor and a plasma is ignited. Molecules containing silicon or carbon that are injected into the plasma are deposited as a thin layer. Since the molecules are highly reactive, they bond very well with the mold.

Up to 300 percent elasticity

But there's a snag: plasma reactors are at best five cubic meters in volume, which means only relatively small molds can be coated. So the researchers in Bremen, together with experts from Fraunhofer IFAM's Project Group Joining and Assembly FFM in Stade, decided to strike out in a new direction. "We wanted to make the process available for big components too, for instance in aircraft manufacturing, by means of an appropriate release film," says Dipl.-Ing. Gregor Graßl, FFM project manager. While release films are already commercially available, they are very stiff. This means they cannot be deep drawn and are suited only to simple mold contours. The IFAM scientists, on the other hand, are using a film that while tough also demonstrates up to 300 percent elasticity. What's more, at less than 0.1 millimeters it is extremely thin. "That means it can also be applied to curved or structured surfaces without creasing," says Graßl.

The challenge that had to be overcome was how to get the coating to stick to the film. "We developed a plasma process which relaxes the release layer. Put another way, the layer enters a state of equilibrium as soon as the plasma is turned off and no more

highly reactive particles are formed, and the molecules it contains then organize themselves such that the surface no longer exhibits any reactive groups," explains Ott. As a result, the resin of the composite part does not bond with the release layer, but the release layer bonds very well with the film – not detaching even when subjected to forces such as extreme stretching. In contrast to the films available to date, this new film leaves no residues of release agents on FRP components. "We are using what amounts to a new class of materials that, by virtue of their chemical structure, are harder than classic polymers," says Ott.

This film, known as Flex$^{PLAS®}$, has already demonstrated that it can cope with real-life production demands in the FFM development hall. It is currently being tested by a number of customers.

Matthias Ott and his colleague Gregor Graßl were honored by Germany's Federation of Reinforced Plastics (AVK), an industry body, with an AVK Innovation Award 2012 for their scientific work. Taking first place in the "Innovative Processes and Procedures" category, the researchers received their award at Composites Europe, the European trade fair and forum for composites, technology and applications, at the beginning of October in Düsseldorf.

Release from mold, transfer and protection with Flex$^{PLAS®}$ technology from Fraunhofer IFAM. (© Fraunhofer IFAM) | Picture in color and printing quality: www.fraunhofer.de/press

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The energy of stunt kites

Kite surfing has risen to become a fashionable sporting activity, with the number of enthusiasts participating in this cross between wind surfing and stunt kite flying growing at a tremendous pace. When the wind catches the kite, the surfer is carried meters into the air; and the greater the leap, the bigger the thrill. But a modern stunt kite is capable of being much more than a mere piece of sporting equipment – it has the potential to become a valuable energy producer. A stunt kite's aerial movements can be used to drive a generator, which in turn converts this kinetic energy into electricity. This dynamic idea came to the founders of Berlin-based wind energy developer NTS GmbH. To make their concept a reality, they brought in the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart. The project partners intend to use their new method to harness the power of strong winds at altitudes of up to 500 meters.

Joachim Montnacher, an engineer at the IPA, explains how a "kite power station" works thus: "The kites fly at a height of 300 to 500 meters, perfectly positioned to be caught by strong winds. Cables, about 700 meters in length, tether the kites to vehicles and pull them around a circuit on rails. A generator then converts the kinetic energy of the vehicles into electricity. The control and measuring technology is positioned on the vehicles." Compared to conventional wind farm technology that relies on rotors, this technology offers a wide range of advantages. Wind speeds at ground level tend to zero, but they increase dramatically the higher you go. At a height of 100 meters wind speeds are around 15 meters a second; at 500 meters they exceed 20 meters a second. "The energy yield of a kite far exceeds that of a wind turbine, whose rotor tips turn at a maximum height of 200 meters. Doubling the wind speed results in eight times the energy," says Montnacher. "Depending on wind conditions, eight kites with a combined surface area of up to 300 square meters can equate to 20 conventional 1-megawatt wind turbines."

More consistent winds at 500 meters

Kites do not have to struggle with the constancy of the wind the way turbines do, because the higher you go, the windier things get. Figures for the past year show that at a height of 10 meters, there is only about a 35 percent chance of wind speeds reaching 5 meters a second, but at 500 meters that likelihood goes up to 70 percent. This makes any number of new lowland sites viable for the production of wind energy. Another advantage is that it costs considerably less to build a system that, among other things, does not require towers each weighing hundreds of tons.

The project partners have clearly divided up responsibilities: NTS GmbH will design the kites and construct the high-altitude wind farm, and the researchers from the IPA will be in charge of developing the control and measuring technology, which includes the

cable winching mechanism and cable store. One of the jobs of the control unit is to transmit the measuring signals to the cable control and kite regulation mechanisms. A horizontal and vertical angle sensor located in each cable line and a force sensor within the cable distributor guarantee precise control of the kite's movements as it follows either a figure-of-eight or sine-wave flight path up above. These flight maneuvers generate a high pulling power of up to 10 kilonewtons (kN) – meaning that a 20-square-meter kite has the capacity to pull one ton. Each vehicle is pulled by a different flight system.

At a test site in Mecklenburg-West Pomerania, IPA researchers and NTS GmbH have already been able to send a kite on its maiden voyage along a 400-meter-long straight track. A remote control similar to those used to fly model planes was used to manually control the kite. The experts now want to reconfigure the test track making it into a loop. Computers will eventually be used to achieve fully automatic control of the kites.

"According to our simulations, we could use an NTS track running a total of 24 kites to generate 120 gigawatt hours a year (GWh/year). To put this into perspective, a 2-megawatt wind turbine produces around 4 GWh/year. So an NTS system could replace 30 2-megawatt turbines and supply power to around 30,000 homes," says Guido Lütsch, managing director of NTS GmbH. After successful test flights on the demonstration track, the project partners are confident that their computer simulations will hold up in reality. The first investors are already on board.

A kite makes its maiden voyage at the test site in Mecklenburg-West Pomerania. (© Fraunhofer IPA) | Picture in color and printing quality: www.fraunhofer.de/press

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3D positioning for museum buildings

Rather than battling their way through weighty guide books, museum visitors would much rather have direct access to the relevant information on individual exhibits – and preferably as a multimedia experience: What is the sculpture really about? Where did the painter of the picture come from? How did the inhabitants of historic settlements use to live? To enable their guests to relive art, history or technology, museums and application developers are increasingly turning to awiloc® (www.awiloc.com), a wireless LAN positioning technology developed by the Fraunhofer Institute for Integrated Circuits IIS.

This technology allows mobile devices such as smartphones to recognize which exhibit a visitor is currently closest to, so it can provide relevant information through video, audio and text. This makes the cumbersome process with conventional audio guides, where numbers must be located and entered on a keypad, a thing of the past. The solution has been reviewed by the Bavarian State Office for Data Protection and operates independently, which is to say without the exchange of data. The positioning is accurate to within a few meters and does not require a networked WLAN infrastructure. Researchers will be demonstrating the awiloc® system in action at the denkmal trade fair in Leipzig (Hall 2, Booth H30) from November 22-24.

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Retrieving similar pictures quickly

These days, smartphones are our constant companion, always within reach if we want to take a photo. Hard drives are accumulating countless pictures as a result, and it is easy to lose track of all these digital images. Searching for photos with a similar subject becomes a time-consuming task. The automated image searching software available up till now has always taken the query image as a whole. Now, however, researchers from the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB in Karlsruhe have developed PatRe, a piece of software which automatically analyzes distinctive patterns present in the query image and uses them to locate similar patterns in a large collection of images. Any subject can be used for queries as long as it contains patterns in its composition, for instance buildings. In contrast to applications from Google, Microsoft or Facebook, users are not required to upload the query image or the portfolio of images. Instead, PatRe runs autonomously on home PCs or, in the case of security-critical professional applications, on protected local networks.

PatRe was developed as part of the EU's "FastID" project, short for "FAST and efficient international disaster victim IDentification". The program is set to help the authorities in the event of a major catastrophe by allowing victims to be identified by patterns on their bodies such as tattoos. PatRe is also suitable for searching through the archives of zoological or botanical images, catalogs of medical illustrations or digital art collections. A limited demo for Windows is available for download on the IOSB website (www.iosb.fraunhofer.de).

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A better way of evaluating medical samples

Developers of microscopy-based analysis software need to use several different specialist tools to investigate blood smears, bone marrow smears or tissue sections. These tools include suitable microscopes and cameras as well as software to digitize and evaluate medical samples. A single platform that combines these elements has to date been lacking. This gap has now been filled by the SCube, developed by the Fraunhofer Institute for Integrated Circuits IIS in Erlangen. Researchers will be presenting a prototype of the universal microscope and scanning technology at Medica Düsseldorf (Hall 10, Booth F05) from November 14-17, 2012.

The platform contains all the components needed to digitize a medical sample which has been placed on a specimen slide. The SCube can be adapted to a whole range of needs, for instance by selecting various objective lenses. What's more, oil immersion objective lenses can be combined with the built-in oil dispensing system. The SCube scanning software included in the package records the samples at various resolutions to create a digital image. It is possible for other manufacturers and users to integrate SCube into their existing applications via the supplied software interface. As a package solution, the new platform significantly reduces costs when compared with the cost of procuring individual specialist tools.

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