

Link innovative potential – and benefit all

Active and attractive:
Cluster initiatives strengthen your market position



Fit for the future with innovations from cluster initiatives

This brochure presents examples of how companies can reach this goal by exploring new ways of cooperation, together with other companies and partners from the research and development sector. These companies actively participate in cluster initiatives in their regions, in different fields of technology. They use and benefit from the structures and options provided by these networks to exchange information and cooperate with other companies and academic or non-academic research institutions. This results in innovative products, processes and services, and in improved market opportunities which help to sustainably protect the competitiveness of the respective companies.

For technology leadership to take effect, new products, processes and services must be developed and realised. Developing innovations together, and inventing and accelerating innovative processes means achieving a greater overall benefit.

Still not convinced? These numbers speak for themselves:

- Rating of the experts at the Cologne Institute for Economic Research from January 2012: 93 % of the interviewed professors of economics agreed with the statement „Innovations are the most important drivers of economic growth“.
- The company panel at the Cologne Institute for Economic Research (2010): Companies that cooperate in networks or cluster initiatives are more successful than others.

- IMP³rove, a project initiated by the European Commission, and the benchmark study conducted by Fraunhofer IAO (January 2009, Prof. Dr. Dieter Spath) shows: tightly woven networks result in higher growth rates. Companies with strong networks generate 25 % of their turnover with innovative products and services that have been on the market for less than three years, while companies with weaker networks only generate 10 %. The same basically applies to the average growth rates over the past four years. The growth rate for companies with strong networks was 7.1 % compared to 3.2 % for companies with weaker networks.
- Cluster Monitor Germany (BMW i February 2012): For companies, active participation in cluster initiatives means monetary advantages such as licence fees, the reduction of costs, shorter times-to-market, lower financial risk, etc. And also qualitative advantages, for example the gaining of know-how and access to new partners.

**Will you take part?
Find a cluster initiative
that suits you at
www.clusterportal-bw.de**

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Unique event for promoting talents in the aerospace industry

The AIRstudent event was first organized in April 2013. With its unique form, it occupies a niche that is found somewhere in between a symposium, job fair and study trip. The programme includes future workshops, insights into different companies, a fact-finding tour through the history of the aerospace industry and many opportunities for students to contact with companies. Also, the event is part of the international AERO trade fair which makes this event a true highlight.

120 students from five German technical universities and universities of applied sciences arrived to Lake Constance (Bodensee) for three days under the motto of „Contacts | Experience | Career“. The students were from different technical disciplines, among them many future aerospace engineers, who were interested in the topics presented at the event.



With AIRstudent we could realise an innovative event concept which is very well received by the companies, students and other partners.

Bernhard Grieb, Cluster Manager
BodenseeAIRea

A hall on the fairground, located next to the AERO fair, was converted into a big tent city for accommodation. All participants were accommodated at the same location as a central meeting point.

The keynote speaker opening the event and the following future workshops immediately confronted the students with the challenges companies in the aerospace industry are facing today. Finally, the career dinner on the first evening was an excellent opportunity to personally speak to experts and companies from the aerospace industry and their suppliers. Visits to four different companies provided practical insights and opportunities for the future engineers to create contacts.

Get information, make contacts, use opportunities

The participation of the Dornier and Zeppelin museums offered an extremely interesting fact-finding tour to the roots of the aerospace industry. The AIRstudent Night on the second night was also more than a party. This evening event included company presentations and the opportunity to meet and obtain some information in a casual atmosphere. AIRstudent ended with a visit to the most important European trade fair for general aviation, the AERO fair in Friedrichshafen. The AERO hosted the first AEROCareer job fair, of which the participants made good use.



Corporate insights into Astrium and Cassidian.

C O N T A C T

Cluster Initiative	BodenseeAIRea c/o Wirtschaftsförderung Bodenseekreis GmbH (WFB)
Cluster Manager	Bernhard Grieb
Address	Heiligenbreite 34, 88662 Überlingen
Telephone	+49 (0)7551 - 947 19 38
Website	http://www.BodenseeAIRea.de
Project	http://www.AIRstudent.de





Fact-finding tour through the history of aviation on Lake Constance.

Find partners through dialogue – a good example of successful cluster management.

Within the BodenseeAIRea cluster, AIRstudent represents an important milestone in the positioning of the Lake Constance area as a significant aerospace location.

AIRstudent allowed companies to speak to talents directly and inform them about their products and projects and

let them know their requirements for new employees. The companies also learned from the participants about the thoughts and expectations they had with regards to the start of their career.

This event was not only a great opportunity to make high-level contacts but also increased the chances for successful cooperation in the future.



As a European company we are involved in a large number of recruitment activities. The AIRstudent concept convinced us because it promotes personal contacts between companies and students.

Thomas Hierlemann, HR Site
Coordination & HR Senior Business Partner,
ASTRIUM GMBH

Improved breast cancer therapy through genome analysis

From loose network to project cooperation. A cooperation between GATC Biotech, VIVIT and hospitals in the Lake Constance started in 2010 to examine the influence of the genome (DNA) on the course of and response to therapies against breast cancer. This cooperation was enabled by the BioLAGO association.



This project proves that the interconnection of science and industry on a trade-specific platform bears fruit.

Andreas Baur, Executive Manager, BioLAGO

Due to intensive research, the range of treatment options for breast cancer has been extended significantly over the past few years. However, there is a huge variability among the patients suffering from breast cancer so not all patients respond to the therapies the same way. A medicine that works well for one patient may cause severe adverse effects in another. One reason for this is the variability of our genome or DNA.

Cooperation for the benefit of research and patient care.

To improve the situation of patients affected with breast cancer and to identify the best possible individual therapies, several stakeholders from the Lake Constance area started

a joint project in 2010. Among the project partners are GATC Biotech AG in Constance, the „Vorarlberg Institute of Vascular Research“ (VIVIT) in Feldkirch, the Feldkirch regional hospital and the Lake Constance breast centre, represented by the gynaecological departments at the clinical centres in Constance and Friedrichshafen, and the oncological study centre in Ravensburg. The cooperation's goal is to analyse differences in genes and other biomarkers that may influence the effects of medicines on the basis of comprehensive and well-categorised patient groups.

Tissue and blood samples are thoroughly examined using the latest laboratory methods to determine whether specific DNA sections of patients possibly affect the effectiveness or metabolism of medicines. Those therapies patients do not respond to shall be excluded in advance. Furthermore, avoidable adverse effects and unnecessary costs for the health care system could be prevented or at least significantly limited.

The first results have already been presented and will be published shortly. It is planned to complete the project by the end of 2013. The project is funded by the EU within



In the lab, patient samples are tested for genetic modifications that may have an influence on the effectiveness of cancer medication.

C O N T A C T

Cluster Initiative	BioLAGO e.V. – life science network
Cluster Manager	Andreas Baur
Address	Byk-Gulden-Straße 2, 78467 Konstanz
Telephone	+49 (0)7531 - 284 - 27 22
Website	http://www.biolago.org



Pipetting robot for automated sample handling at GATC Biotech AG.

the framework of the „Alpenrhein-Bodensee-Hochrhein“ Interreg IV programme. It was initiated by the BioLAGO network – and the idea came up during negotiations between Dr. Axel Mündlein from VIVIT and Peter Pohl, Chief Executive Officer at GATC Biotech. The two met through the cluster initiative at a BioLAGO event.



Our contact with VIVIT was the result of an event organised by the BioLAGO cluster initiative. This first interaction led to our promising cooperation that aims to improve breast cancer therapy.

Peter Pohl, Co-founder and CEO
of GATC Biotech AG

This resulted in a cooperation that is fully integrated into the BioLAGO network. For more than five years, the international network around Lake Constance has worked on bringing together researchers, entrepreneurs and doctors to develop new projects and products and to promote the area.



The latest technologies in the area of genome decoding help to identify critical characteristics for choosing the right therapy.

New protein crystallisation method for biopharmaceutical purification

Biopharmaceuticals are drugs produced by living cell cultures. From a chemical prospect, most biopharmaceuticals are proteins. Compared to chemically synthesised drugs usually found in pills, such as e.g. aspirin proteins are about 100 times larger. Also, they are much less stable and can easily change their three-dimensional structure, followed by a loss of function if not handled correctly.



Thanks to this excellent networking of our regional R&D stakeholders, translation into practice worked perfectly.

Otto Sälzle, Executive Director,
BioRegionUlm/BioPharMaXX

Over the past few decades, biopharmaceuticals have surged because of their highly targeted action, which enables them to specifically kill cancer cells while leaving healthy cells intact.

Apart from cell culture, purification is a major challenge in the production of biopharmaceuticals, as it means separating the product from thousands of other compounds present in the cells and culture media. A standard method is the use of chromatography columns filled with adsorptive materials to which the various molecules bind more or less strongly. This method is very time-consuming and expensive. Filling just one industry-size column may costs several million Euros! So the task here was to find cheaper and more efficient purification methods.

Interdisciplinary collaboration-key to success.

The partners participating in the collaboration opted for a new approach: purification by crystallisation. Crystals

develop spontaneously if a solute compound becomes insoluble. What comes in handy is that crystals consist of a single compound only, meaning that all foreign compounds are excluded from the crystal and remain in solution. For many chemically synthesized products crystallisation is the preferred method of purification.

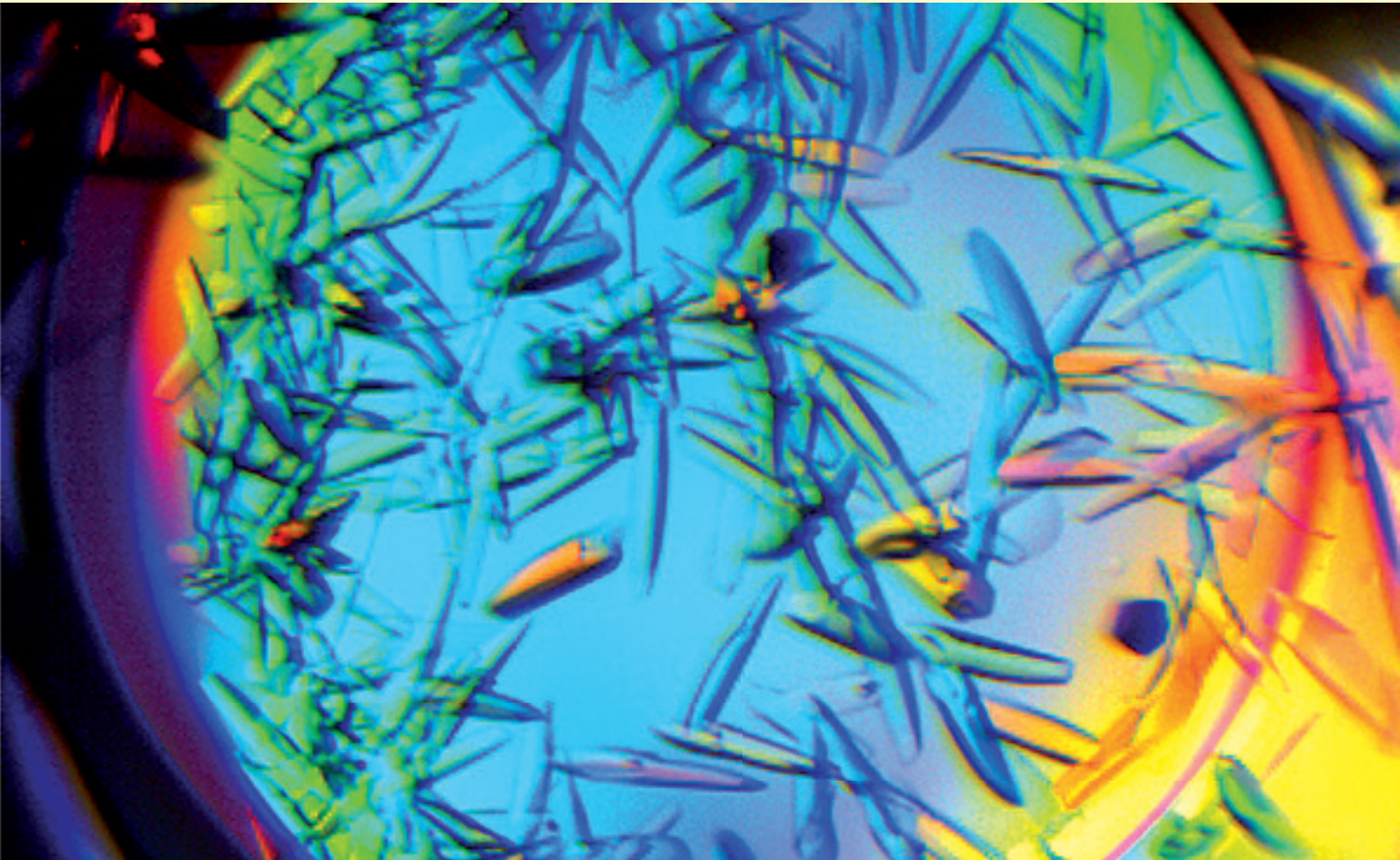
CONTACT

Cluster Initiative	BioRegionUlm e.V. / BioPharMaXX
Cluster Manager	Otto Sälzle
Address	Olgastraße 95 - 101, 89073 Ulm
Telephone	+49 (0)731 - 173 - 224
Website	http://www.biopharmaxx.de

The challenge here was to find conditions under which protein biopharmaceuticals would become insoluble while everything else would remain in solution. However, this challenge was mastered. Once achieved, the crystallization conditions could be transferred from micro to large scale without any major optimisation step. However, this required the knowledge and expertise of engineers who developed suitable reactors for crystallisation at litre-scale and procedures for separating crystals from liquid. The key to success

Crystallisation conditions are identified by mixing the proteins with precipitants. Thousands of experiments conducted at micro-litre scale have to be carried out. Some drops remain clear (for example 8C), some turn cloudy (for example 10C) and a few return crystals (for example 7C).



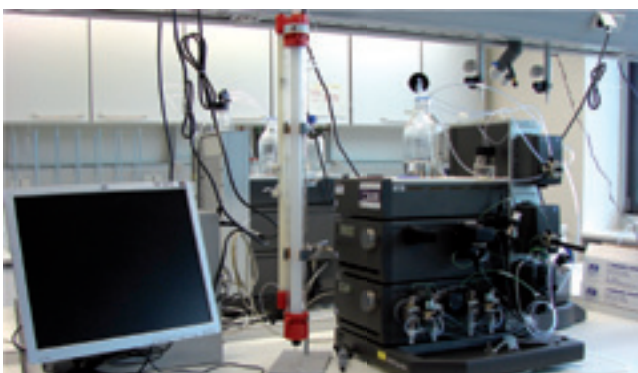


Under a microscope, crystals are clearly visible. An optical technique makes them appear coloured allowing to distinguish them from non-coloured salt crystals.

was the interdisciplinary cooperation between protein biochemists, chemists and process engineers in a well-managed cluster. In accord with the industry partners who supplied the protein material targets with respect to purity and process duration, among other things, were defined. This ensured that the final process could be transferred to

the industry partners, enabling them to conduct feasibility studies and evaluated its use for other biopharmaceutical products.

This project is an example of successful innovative development within the cluster network.



Chromatography system for traditional protein purification. Next to the pump system (right) and the computer control system two separation columns are visible.



Crystallisation makes the purification of therapeutical proteins more efficient and saves money.

Project Coordinator Prof. Dr. Hans Kiefer,
Biberach University of Applied Sciences



Electric cars will charge up independently in the future

The leading-edge cluster Electric Mobility South-West conducts research within a project named BIPoL^{plus} involving non-contact, inductive and position-tolerant charging: a quick-charging system with an electric power of 22 kW using inductive power transfer between the charging station and the electric vehicle.



E-mobility must be developed within a system – and the leading-edge cluster brings together all the important stakeholders

Franz Loogen, Managing Director of e-mobil BW GmbH

Currently, electric vehicles are usually charged by connecting them to regular power outlets using charging cables. State of the art the maximum charging capacity is limited to 3 kW which means that it takes approximately 5 to 8 hours to fully charge a vehicle battery with a capacity of approximately 20 kWh. In poor weather conditions, handling of the cable and thus the charging process may be inconvenient due to dirt and humidity.

Within the BIPoL^{plus} project, 8 partners from industry and science are researching a non-contact quick-charging system with an electric power of 22 kW which is transferred inductively from the charging station to the electric vehicle. The project is scheduled to be completed by the end of 2015. Non-contact power transfer at high charging power results in significantly improved comfort for the

user charging the vehicle and clearly reduced the necessary charging time at once.

Special challenge: component design.

The integration of a 22 kW charging system into a vehicle requires a particularly innovative solution, especially with regards to the design of the individual components. Besides the safety constraints, the specific requirements from the vehicle manufacturers must also be fulfilled.

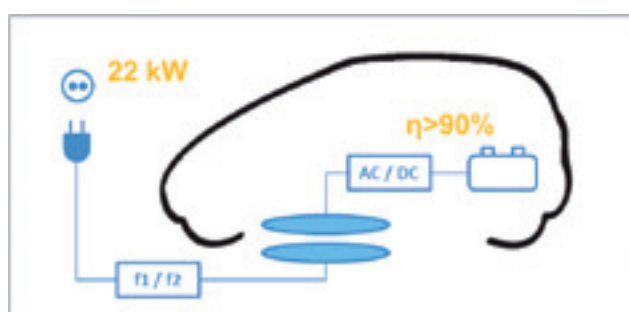
Several aspects must be taken into consideration here: package, communication, positioning, and electrical connections.

CONTACT

Cluster Initiative	e-mobil BW GmbH
Cluster Manager	Franz Loogen
Address	Leuschnerstraße 45, 70176 Stuttgart
Telephone	+49 (0)711 - 89 23 85 - 18
Website	http://www.e-mobilbw.de

Another innovation within the BIPoL^{plus} project requires the integration into the national grid in connection with network services. This innovation has the potential to

Targets and challenges of BIPoL^{plus}.



Compliance with standards and directives

3 kW class interoperability

Prevention of interference with vehicle systems

Identification of foreign objects

System weight

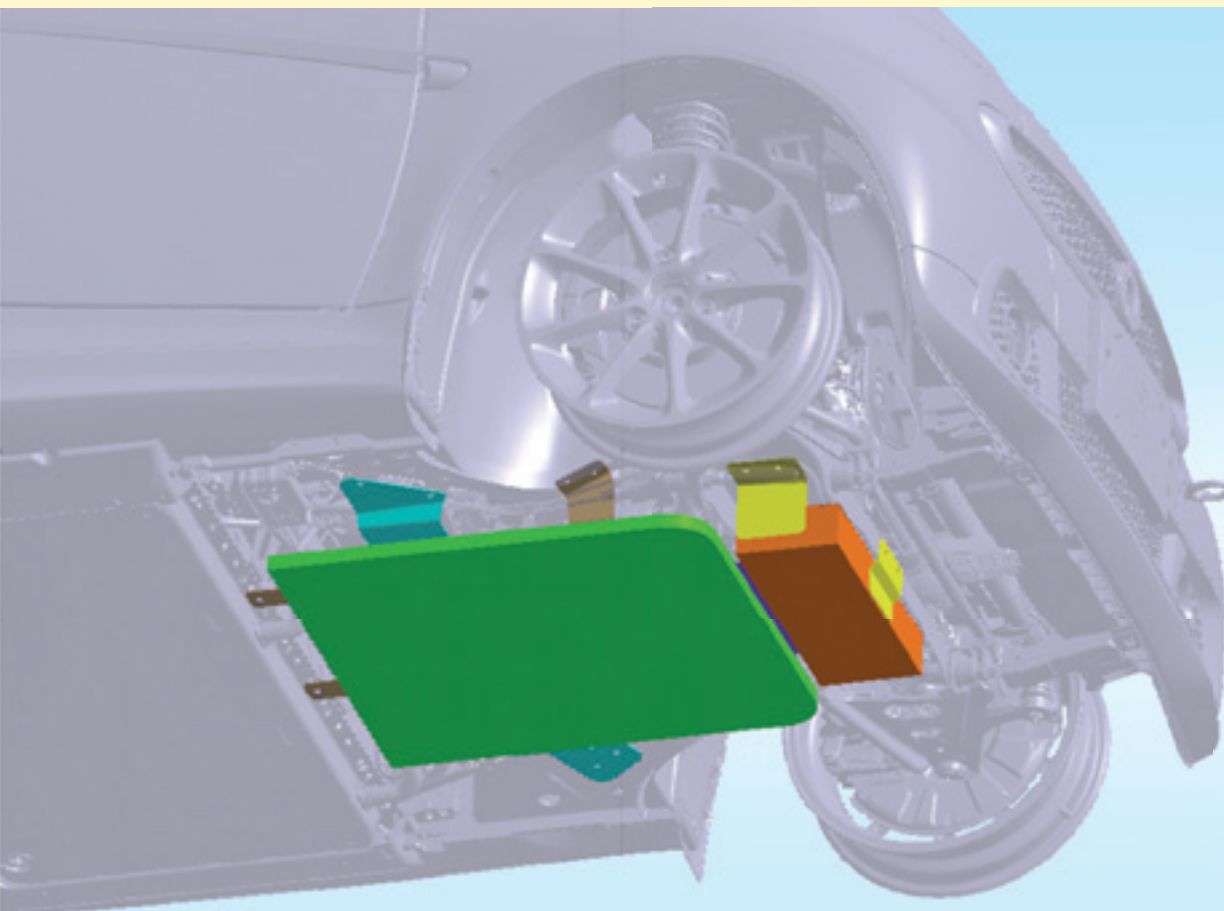
System size

Coil distance

Cooling

Communication

Idle power based network services



Existing drive-train components leave little room for integrating new systems.

improve grid quality and – as a result – the „business case“ of public charging stations. It is currently planned to integrate and test the project developments in various research vehicles from the beginning of 2015.

In the near future, the scientific research results and the respective industrial processes will be applied to new products, processes and services for the electric mobility of the future.

Furthermore, the forward-looking development of their innovative power and thus the securing of available specialists are important project goals of this cluster initiative and its project partners.

e-mobil BW makes it happen.

The cluster management supported the project entity during the application process and in running the preceding joint BIPoL project. This helped to establish a firm and stable base for the continuation of the project in the leading-edge cluster competition.

The management company, e-mobil BW, coordinates the activities of the Electric Mobility South-West leading-edge cluster with respect to technological innovations as well as the interlinking areas of activity, such as education and advanced training, public relations work and internationalisation. This support helps to release the power of innovation.



Cooperation within the leading-edge cluster drives the integration of the inductive charging technology for the vehicle of the future.

Karlheinz Baier, Manager
Wireless Charging, Daimler AG

FiberBone – Fibres for thin-walled skull implants

Often bone defects resulting from accidents or bone-destroying diseases cannot be repaired by the patient's own bone material. In such cases, implants are used which are currently mainly made of titanium. However, this is not the best possible solution.

Especially with thin-walled implants for the human skull, the requirements of material-science are extremely high. A material is ideal if its mechanical strength, specific weight and thermal conductivity are similar to that of human bones. Materials such as titanium or glass ceramics meet these high requirements to a limited extent only.



**Fibres save lives.
Textile innovations in medicine
prove it every day. FiberBone
is an important step.**

Ulrike Möller, Network Manager,
Alliance for Fibre-Based Materials
Baden-Württemberg

Therefore, it is a big goal to replace titanium implants with alternative materials featuring a lower weight but yet high strength and a lower thermal conductivity.

The project aims to develop a biocompatible, ceramic fibre reinforced material that is well suited for the production

of implants in the area of the skull. Fibre ceramics feature excellent mechanical properties and are therefore ideally suited to producing extremely robust thin-walled implants.

Competencies complementing each other – networking for optimal solutions.

This joint project ideally combined the competencies of the Institute of Textile Chemistry and Chemical Fibres (ITCF) in Denkendorf with the huge experience and expertise of the four involved companies, Walter E.C. Pritzkow Spezialkeramik, CeraFib GmbH, CeramTec GmbH and ITV Denkendorf Produktservice GmbH.

The project comprised the full production chain for ceramic compound materials, including mechanical and biological testing.

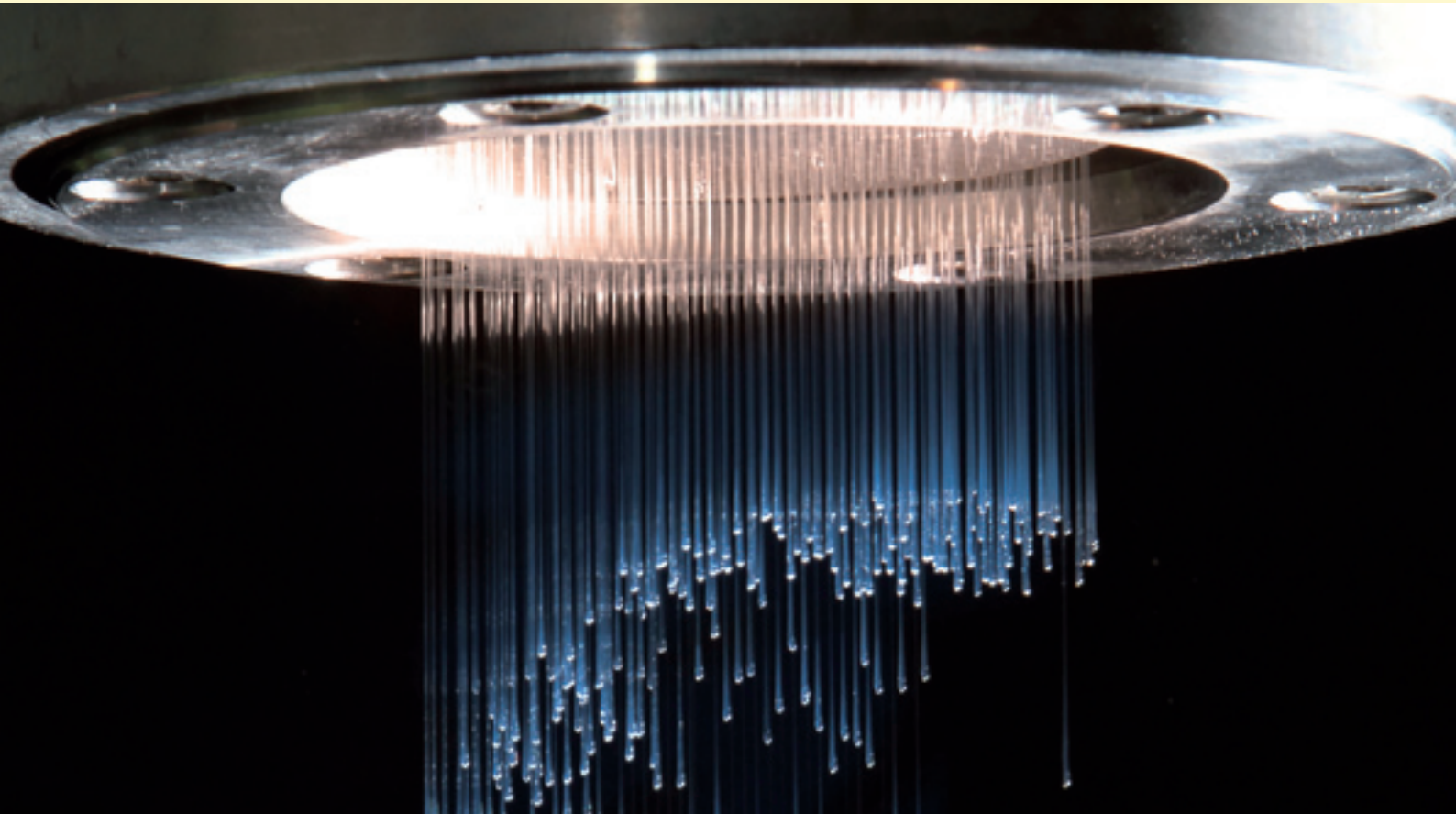
This ensured the project's success. The partners managed to produce thin-walled model implants made of ceramic compound materials with outstanding mechanical stability and biological properties (cytotoxicity and biocompatibility) which promise a bright future for this bone-replacing material.

C O N T A C T

Cluster Initiative	State-wide Network AFBW – Allianz Faserbasierte Werkstoffe Baden-Württemberg e.V.
Cluster Manager	Ulrike Möller
Address	Gerhard-Koch-Str. 2-4, 73760 Ostfildern
Telephone	+49 (0)711 - 32 73 25 13
Website	http://www.afbw.eu



FiberBone implants for eye socket and cheekbone.



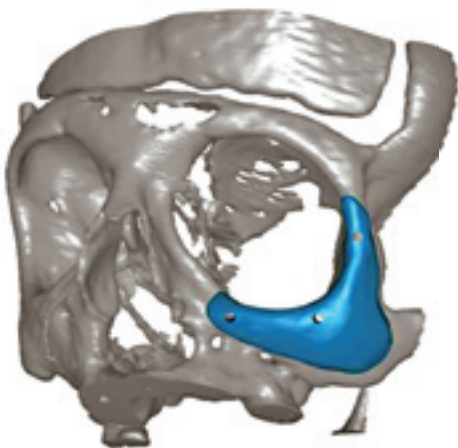
Dry-spinning process using ceramic fibres.

A development that helps save lives.

The results worked out in this networking project show the great potential this newly developed Al_2O_3 fibre/ $\text{Al}_2\text{O}_3/\text{ZrO}_2$ material has for reaching the project aim, that is thin-walled implants for the human skull.

The material is biocompatible and provides excellent conditions for the settling of bone cells, without any further treatment. By depositing ceramic fibres in the

matrix material, implants can be produced that are very similar to the final contour even before baking. The compound material can be adapted to the most varied individual stress scenarios by different arrangements of the fibre layers in the implant. The results of this project are an excellent example of successful cooperation within a network. They allow clinical testing for its use in practice and also for utilising this technology for other skeleton fractures.



3D image of fitting a FibreBone implant.



FibreBone is a new type of bone-replacing material. It is only the cooperation within this joint project that allowed us to reach our goals.

Dipl.-Ing. Walter E.C. Pritzkow,
Managing Director Walter E.C. Pritzkow
Spezialkeramik, CeraFib GmbH,
CeramTec GmbH and ITV Denkendorf
Produktservice GmbH

Practical help for Greece with solar energy

Since 2012, there has been an extremely strong increase of particulate matter in the air. A major reason for this is the dramatic increase of the tax on heating oil, by approximately 40%! In winter 2012, one litre of heating oil cost as much as EURO 1.40. Due to this price increase, many Greek people used wood as fuel instead. This has not only led to the cutting down of climate-friendly forests but has also resulted in an increase of the particulate matter concentration in the air; in the city of Volos, for example, by approximately three times the maximum limit allowed in the EC.

The members of the Environmental Technology Network learnt about this development from a Greek delegation visiting the Constance district in October 2012. Since then, the network has offered its support with innovations and corporate know-how, with the goal to increase the energy generated in solar thermal power plants in Greece.



With our head office in the region around Lake Constance where four countries meet, international cooperation comes naturally. Our Greek project partners benefit from this as well.

Thorsten Leupold, CEO Bodensee Standort Marketing GmbH (Lake Constance Region Location Marketing - BSM)

Oliver Kleiner, owner of an engineering consultancy for construction and energy and member of the network, describes his intent as follows: „As an entrepreneur within the Environmental Technology Network, I would like

to make a contribution and also to help expand and promote international relations“.

It showed that due to the high solar irradiation the conditions are excellent for solar energy generation and that in Greece the potential is high to yield extremely high profits. However, it must be considered that the usual solar thermal power plants easily overheat in regions with intense insolation. An innovative solution is an input-optimised thermal solar system plant with tracking function. Under excessive insolation, this system moves the panels out of direct solar radiation to prevent overheating.

On the other hand, this technology allows the panels to track the sun and so optimise solar power yield during the winter. In addition, it makes it possible to achieve high inlet temperatures for solar thermal cooling.

Cluster help for self-help: Greek companies and craft businesses are involved.

Part of our support is to open up a new field of business for manufacturing and processing companies and craft

C O N T A C T

Cluster Initiative	Netzwerk Umwelttechnologie e.V.
Cluster Manager	Thorsten Leupold, Vorstand Cluster,
Address	Bodensee Standort Marketing GmbH Businesspark Konstanz Max Stromeyer-Str. 116, 78467 Konstanz
Telephone	+49 (0)7531 - 800 - 1453
Website	http://www.netzwerk-umwelttechnologie.de



Old defective large non-tracking solar thermal power plant in Greece.



Input-optimised tracking thermal solar system plant („Solarblume“/„PowerFlower“) on Lake Constance.

businesses in Greece. This includes the erection of a demonstration and training plant so that the companies there can familiarise themselves with this technology. In addition, the Environmental Technology Network as a platform gives its members the opportunity to transfer their know-how.

The German-Greek assembly (DGV), the chamber of engineers of Volos, several mayors and craft businesses, industry companies and citizens of Greece have recognised the potential of this transfer project and hope that this innovative entrepreneurial know-how may bring new life to their region.

The result of which we can be proud:

Once the necessary funding has been provided, the pilot and training plant can be built in 2014 which will result in added value for the region.



The network of the environmental technology cluster works very well. This platform generated our first contacts with Greece.

Oliver Kleiner, Dipl.-Ing. (FH),
owner of an engineering consultancy
for construction and energy

Research for the technology of the future: „Organic Electronics“

Organic Electronics (OE) – one of today’s technologies of the future – targets applications that are used to manufacture electronic components on the basis of conducting and semi-conducting plastics. It provides answers to many of the key issues of today’s society that cannot be solved by conventional silicon-based technologies. OE ensures the effective and responsible management of our resources and allows mobile flexible products for a fully integrated world.



Interdisciplinary research is definitely more effective if all the necessary stakeholders, including the companies cooperating in an open cluster initiative, commonly work at a central location.

Dr. Martin Raditsch, Managing Director
InnovationLab GmbH and Cluster Manager
Forum Organic Electronics (FOE)

OE’s applications of use are as versatile as they are fascinating: They range from organic solar cell films that can be invisibly applied to building windows or vehicle screens to organic light-emitting diodes (OLEDs) that consume 50 % less energy than current energy-saving lamps or organic sensors that can be used, for example, to measure organ function through the skin.

To conduct research on the fundamental issues of OE, a very well equipped research platform was established

at the location of InnovationLab GmbH in Heidelberg, with the support of the Leading-Edge Cluster Competition of the Federal Ministry of Education and Research (BMBF) and of the state of Baden-Württemberg. Here, 150 scientists from science and industry work together in the Forum Organic Electronics (FOE) leading-edge cluster, to examine and adjust significant production steps in OE which have so far existed and developed decentrally and independently from each other.

Network partnership within a cluster creates more efficiency and boosts innovative power.

The cluster bundles the know-how of globally active companies – among them many world-market leaders and renowned universities and research institutions, to make Germany a world leader in the development of OE.

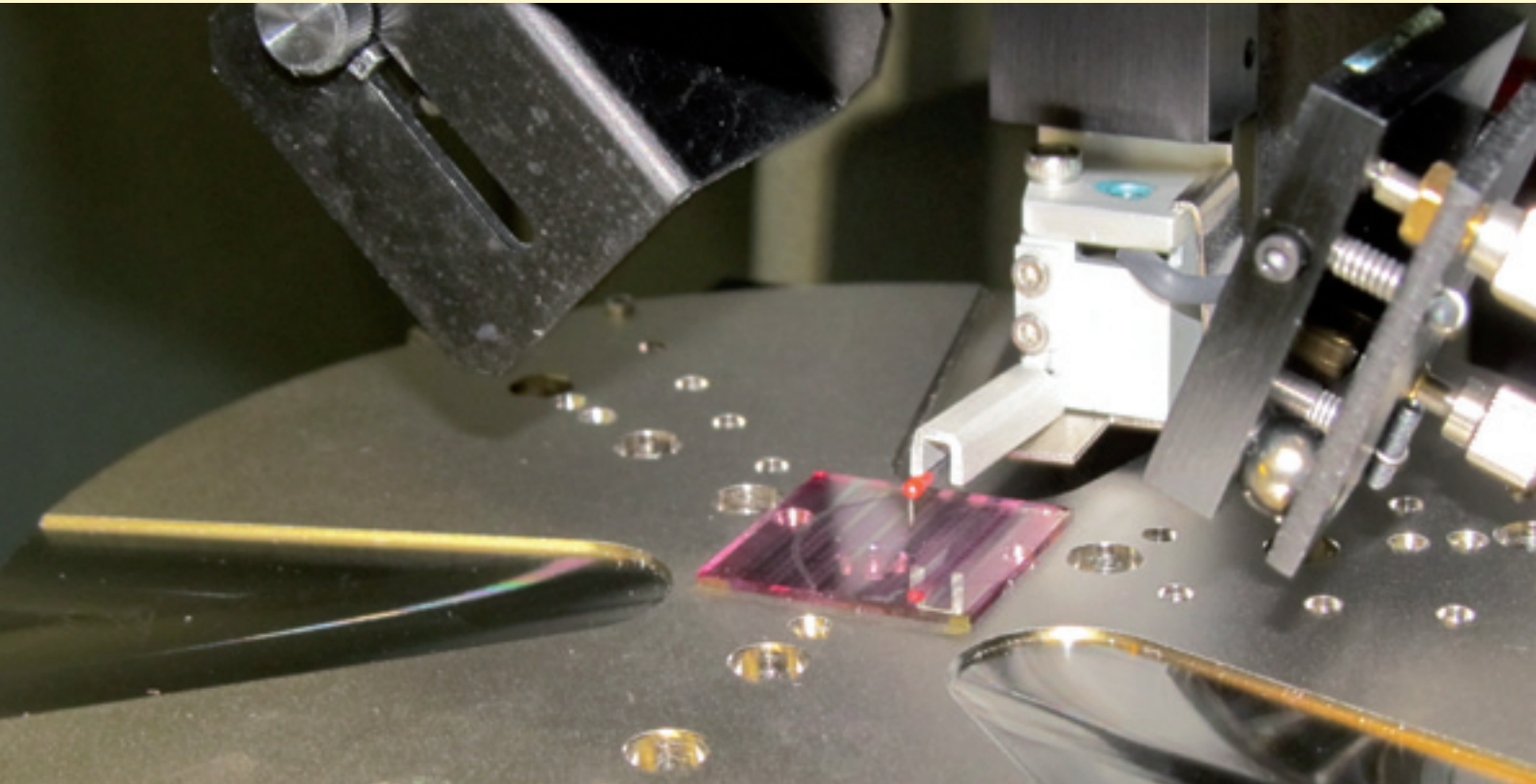
This form of cooperation at a central location can answer similar questions that arise in different projects more efficiently, which helps to overcome technological obstacles quicker and to increase the cluster’s innovative performance.

CONTACT

Cluster Initiative	Forum Organic Electronics
Cluster Manager	Dr. Martin Raditsch
Address	Speyerer Straße 4, 69115 Heidelberg
Telephone	+49 (0)6221 - 54 19 100
Website	http://www.innovationlab.de



Slot die coating on high-precision slot die system.



Layer characterisation on printed organic field-effect transistors (OFET) by means of a (Dektak) profilometer.

Production of components with the innovation potential of the printing industry.

The „GutenbergPlus“ project aims at application-oriented research on suitable materials, production methods and components for OE. The project's focus is on the reproducible production of components, by solely using inkjet, gravure printing, flexo printing and slot-die coating processes. This is because printing technology has a great innovative potential in this area. By using fluids from specific soluble polymers, this method is simple, cost-efficient and friendly to the environment and thus allows

the ecological and economically profitable mass production of electronic components.

In order to optimize processes that meet the necessary requirements in terms of precision and accuracy for a future reproducible and industry-compatible production, new printing and coating systems are being developed at InnovationLab in Heidelberg. Another emphasis of this project is the printing of OLED components on different substrates, for example flexible glass, polymer films, paper or non-woven materials (micro fibre).



Clean room at InnovationLab GmbH.



Doing research together with companies helps to adjust the processes and equipment to the specific requirements of OE more rapidly.

Dr.-Ing. Philip Scharfer,
Head of Thin Film Technology,
Institute of thermal process engineering,
Karlsruhe Institute of Technology (KIT)

Successful development of a new sensor technology for solar panels

The start-up company „SmartExergy WMS GmbH“ located in Freiburg develops and markets products in the field of wireless monitoring sensors for photovoltaic panels. The first contact was made by the cluster management and it resulted in the development of cooperation with solar panel producer SI Module. Soon the two cluster members developed a new type of monitoring technology for solar panels which provided much more security and a higher yield for photovoltaic systems.



The project shows how important it is to actively contact suitable partners and how important the role of the cluster management is in this regard.

Dr. Michael Richter,
Cluster Management FWTM

Joint development product: the safe and cost-efficient monitoring and control of photovoltaic systems.

With this new monitoring technology, each individual solar panel has its own wireless sensor which monitors and controls it. The sensor locates itself and its module so that there is no extra expense for installation.

The individual solar panels are regularly activated by the central master communication interface which allows the wireless collection all relevant data. This activation function is part of the innovation and it allows failure-free

bidirectional communication with up to 65,000 nodes at minimum power consumption. The analysed data can be retrieved any time via an Internet portal.

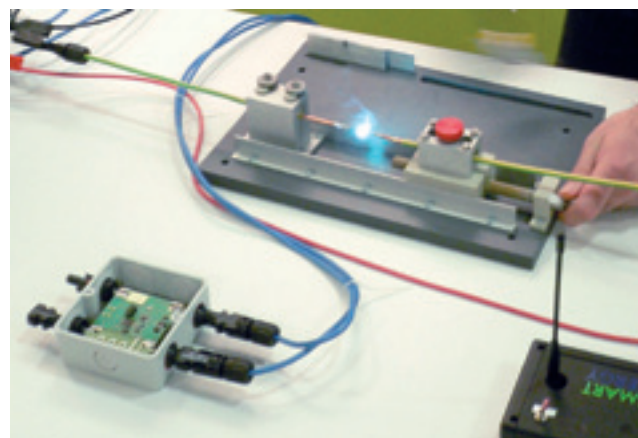
Individual solar panels can also be controlled and deactivated through the sensor system. This is extremely important, particularly in case of maintenance work, in case of dangerous occurrences such as electric arcs or in case of fire. It also helps to quickly identify and locate failures, for example due to installation or production faults or damage through the elements – for each individual panel.

Interruptions with a loss of performance can thus be remedied without any expensive delays. By switching off panels in the shade, the yield of the photovoltaic system may be increased.

Another big advantage: existing systems can be refitted without any problems. Thanks to its outstanding properties, this new technology from SmartExergy WMS is particularly well suited for wireless, maintenance-free, robust and enduring sensor networks.

CONTACT

Cluster Initiative	Green City Freiburg
Cluster Manager	Dr. Michael Richter
Address	Rathausgasse 33, 79098 Freiburg
Telephone	+49 (0)761 - 3881 - 1201
Website	http://www.fwtm.freiburg.de
Project	http://www.greencity-cluster.de



Wireless sensor technology detects electric arcs.



Overview and properties of the new monitoring technology from SmartExergy WMS.

A success that confirms the value of cross-clustering.

Thanks to its outstanding properties, this new technology from SmartExergy WMS and SI Module is perfectly suited for wireless, maintenance-free and cost-saving sensor networks. This new development which is based on micro-system technology is also an excellent example of the benefit of cross-sectoral technologies and the great advantages of cross-clustering.

The cluster offers great benefits for newly established companies.

Their membership in the cluster granted the young company SmartExergy WMS access to knowledge transfer events and, with the cluster management acting as a contact broker, this resulted in a cooperation with SI Module.

This cooperation bore fruit soon and quickly led to the development of innovative applications such as the new monitoring technology.



The cluster gives us the opportunity to find cooperation partners to translate our unique wireless sensor technology into exciting new products.

Patrick Steindl and Dr. Tolgay Ungan, founders of SmartExergy WMS GmbH

Investigations into effective, cost-saving protease tests

Biopharmaceutical producers use living micro-organisms – mammalian cells or *E. coli* bacteria – to produce active ingredients and they must always bear in mind the risk of viruses, endotoxins or proteases when they cultivate them. During and after purification, it must be verified in bioassays that these undesirable components have been removed safely and successfully. Until now, there has been no method available to precisely identify proteases. This gap is now to be closed by an adsorber resin that will carefully remove proteases from the fermented cell culture medium.



The innovative power of our cluster companies cooperating with the University of Ulm enables trendsetting developments like these.

Otto Sälzle, Executive Director,
BioRegionUlm/BioPharMaXX

In a joint project sponsored by the federal government, Labor Dr. Merk & Kollegen (located in Ochsenhausen) developed a process together with two partners from the same region that helps to detect proteases – that are greatly feared by the producers of biopharmaceutical products – more comprehensively, even traces thereof, and separates them from the therapeutical product more effectively.

Dragnet investigation for killers of active ingredients.

Proteases have an ability to degrade proteins and thus also active ingredients. Therefore, every producer of pharmaceutical products removes them in the purification process. They exist in the tissue and cells of all organisms and have different optimum pH values; often they remain active at temperatures of -20°C. Even if only traces exist in the final product, the active ingredients must be stabilised extensively or lyophilised. Therefore, proteases play an important role in any purification process. Because once the cells are dis-

rupted to harvest the active ingredient produced therein, the proteases come into contact with it and have an adverse effect on yield. The protease tests commonly available on the market are often too unspecific and vary significantly in their detection limits. They don't clearly identify which proteases still exist in the medium. The only alternative – the use of protease inhibitors – is mostly excluded due to their high toxicity.

The result of an innovative partnership: protease test for early detection.

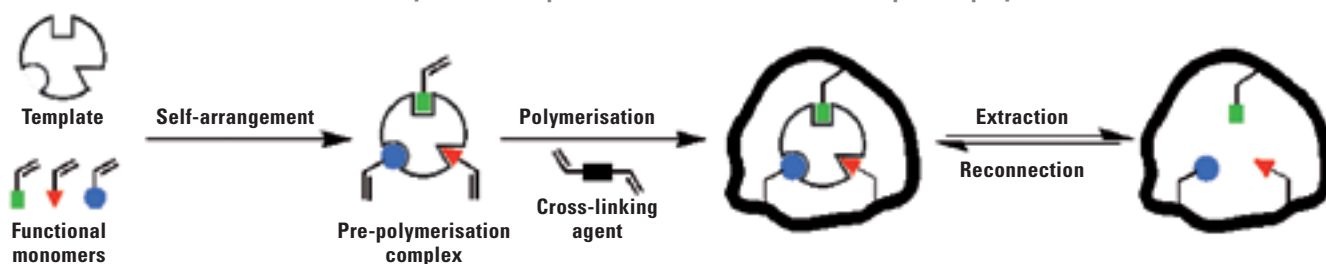
So far, the separation of undesired proteases had to be developed extensively and for each purification step individually. The Ulm chemist Professor Boris Mizaikoff accepted

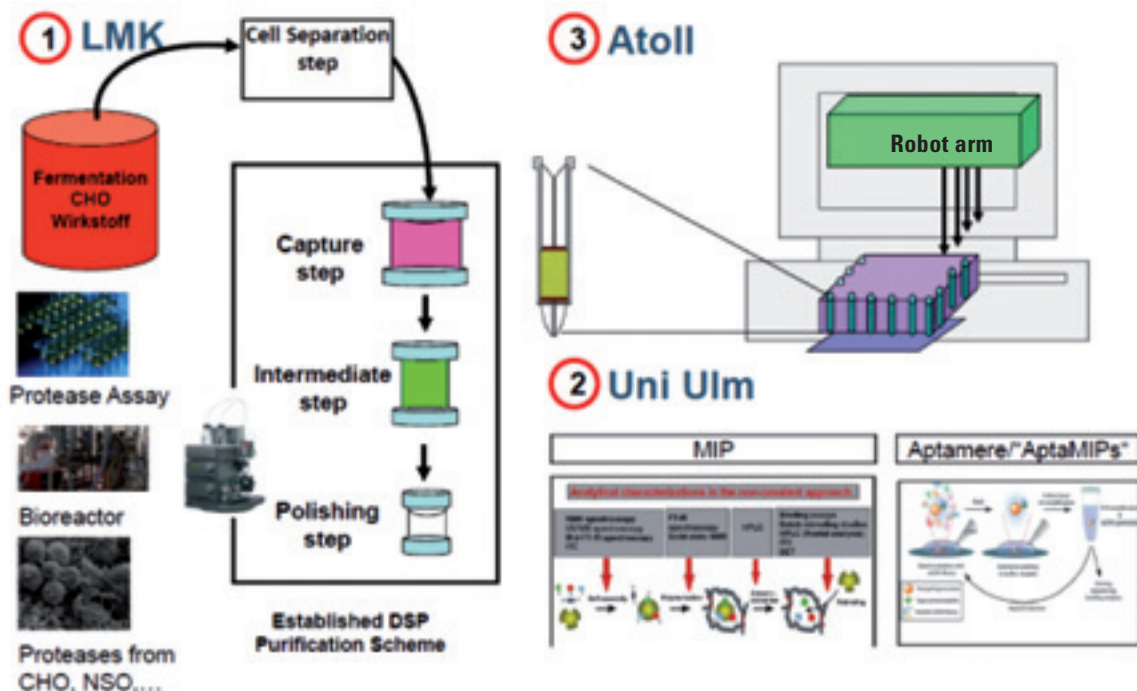
CONTACT

Cluster Initiative	BioRegionUlm e.V. / BioPharMaXX
Cluster Manager	Otto Sälzle
Address	Olgastraße 95 - 101, 89073 Ulm
Telephone	+49 (0)731 - 173 - 224
Website	http://www.biopharmaxx.de

this as a challenge and faced it with a new development. This new process takes place even before the down stream processing in various chromatography columns and at the end of the purification process – using selective affinity ligands that bind proteases in a highly specific manner and

Production of synthetic receptors on the basis of molecular imprinted polymers.



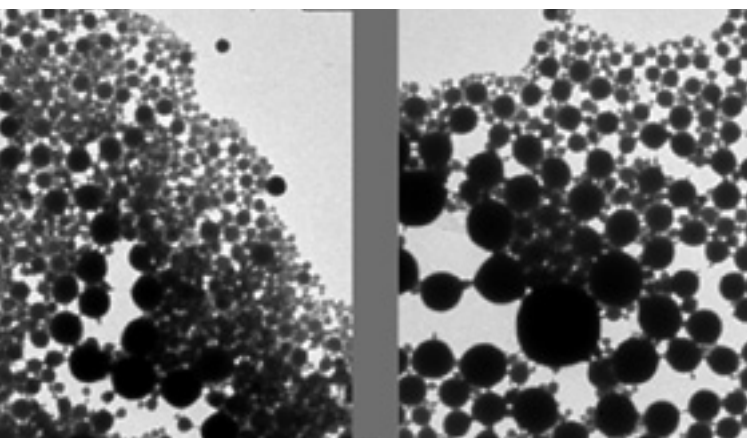


Cooperation and working packages of the three project partners:

1 = Labor Dr. Merk und Kollegen GmbH, 2 = University of Ulm, 3 = Chromatography specialist, Atoll, Weingarten

so connects them to the adsorber resin so that they cannot escape. His protease analysis concentrates on the three or four critical proteases that play a central role in biopharmaceutically relevant mammalian cells such as CHO, NSO and BHK. Chromatography specialist Atoll from Weingarten contributed his competencies in the area of method development and screening of all kinds of chromatography materials and supplied single-use columns with chromatography materials for immediate use.

The resulting protease test in development intends to provide the producers of biopharmaceutical products with a more detailed picture of the proteases included in the fermentation medium so that the producer will know which proteases can be expected to occur in which purification process. This may possibly help to save a full step of the expensive purification process. However, there are still further optimisation steps necessary before the test could be launched.



Molecular imprinted polymers.



The cluster initiative allows us to realise this innovative project together with our excellent partners from this region.

Project coordinator Dr. Ingrid Rapp,
Chief Executive Director,
Labor Dr. Merk & Kollegen GmbH



German-French commuter traffic. Cross the border with electric RheinMobil.

The RheinMobil cross-border project is one of 40 projects within the Baden-Württemberg electric mobility showcase programme „LivingLab BWe mobil“. Its goal is to collect data on the commuters' annual kilometrages to obtain some practical information on the economical and ecological benefit of the project.

In May 2013 the French employees of Michelin started using the first electric vehicles for their daily trips from Alsace to their workplace in Karlsruhe. At the same time, employees of Siemens started using electric vehicles for their business trips between the sites in Karlsruhe and Haguenau. They drive up to 360 kilometres per day. Operational profiles are recorded individually.



This regional showcase project is of great significance. AEN members have the academic and also entrepreneurial competence for this test project.

Marcus Ehrgott, Cluster Manager
Automotive Engineering Network (AEN)
South-West

Since then, the RheinMobil vehicles have saved almost two tonnes of CO₂ in total. Dr. Olaf Wollersheim, one of the project managers at the Karlsruhe Institute of Technology (KIT) reckons that there will be savings

of just under four tonnes per year. With distances of 60 to 80 kilometres one way, the limited range has not been a problem in practice so far. The first results have shown that the parking times for charging are sufficient and can be scheduled well.

Economy through high degree of utilisation.

Based on the current values, annual kilometrages of almost 40,000 kilometres are possible. However, RheinMobil targets an even higher degree of utilisation. In addition, the project examines the option of 30-minute quick-charging processes and their influence on battery performance. Their goal is 3,000 quick-charging operations per year.

The involved scientists and the KIT project managers Dr. Olaf Wollersheim and Dr. Kevin Stella rely on the knowledge gained from the KIT "Competence E" project involving lithium-ion technology.

Operation of the vehicles is not yet profitable although the drivers recover approximately 15% of the used energy while braking. A forward-looking driving style also helps to extend the range.

C O N T A C T

Cluster Initiative	Automotive Engineering Network (AEN) Südwest
Cluster Manager	Marcus Ehrgott
Address	Heinrich-Wittmann-Str. 23, 76131 Karlsruhe
Telephone	+49 (0)721 - 626 903 99
Website	http://www.ae-network.de



Fleet management for RheinMobil is the responsibility of e-Motion Line GmbH.



An important question raised by the project is: What influence does such an intense battery utilisation have on the ageing of its cells?

User experience is clearly positive.

Michelin currently operates two vehicles that are used by seven people. Siemens uses its vehicles regularly for business trips to its Haguenau site which is 70 kilometres away. In this way, Siemens site manager Hans-Georg Kumpfmüller intends to have employees experience electric mobility first hand and to increase their awareness of the environment. Everyone using an electric vehicle for the first time mentions its excellent comfort and

driving experience. During the project, the motivation and expectations of the participants are continuously examined by the Fraunhofer Institute for Systems and Innovation Research ISI.

Initial interviews have shown that curiosity about the technology, low operating costs and an awareness of the environment are the relevant aspects that make the participants join the project.



The RheinMobil project, as part of the cluster initiative, goes extremely well with our corporate culture because we can transfer our fundamental value of respect for the environment into practice.

Christian Metzger, Site Manager
Michelin Karlsruhe

Secure data transmission – a trendsetting development

In 2008, companies, scientific institutions and universities in the area of satellite communications founded the German Center for Satellite-Communications r. S. (DeSK) located in Backnang. Its goal is to combine the competencies of the involved companies and institutions to form a powerful network and strengthen cooperation.

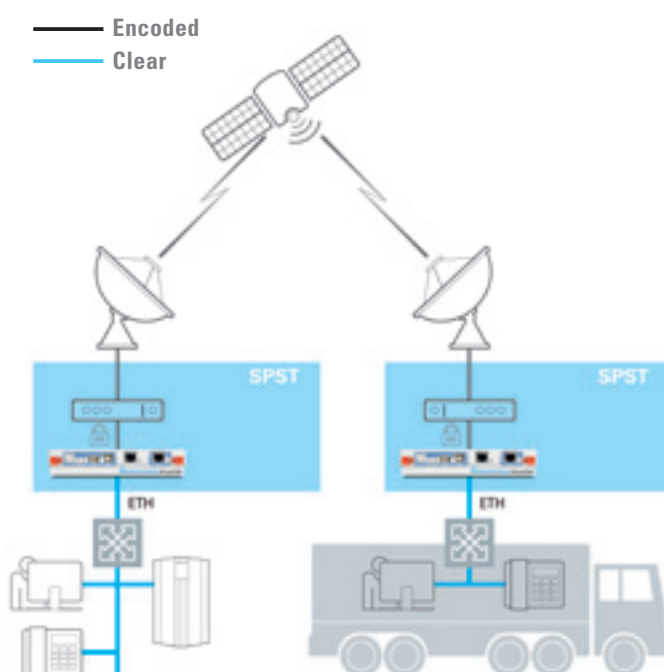


DeSK offers its members a unique networking platform in the area of satellite communications on a national level.

Dilara Betz, German Center for Satellite-Communications r. S. (DeSK)

In the meantime, DeSK has 24 members operating along the entire value-added chain of satellite communications, contributing their know-how in areas like microwave and cryptographic technology, design and construction of complete communication satellites and ground stations as well as the procurement and operation of satellite systems.

Illustration Secure Portable SatCom Terminal (SPST).



The initiative is supported by the Ministry of Finance and Economy of Baden-Württemberg with funds from the European Regional Development Fund (ERDF), enabling the setup of a professional cluster management and as a result, the expansion of the DeSK activities.

A cooperation between two members of the cluster initiative soon resulted in a first development success. This shows that such competent cooperation projects can generate innovative solutions more quickly.

Secure data transmission for confidential communication via satellite.

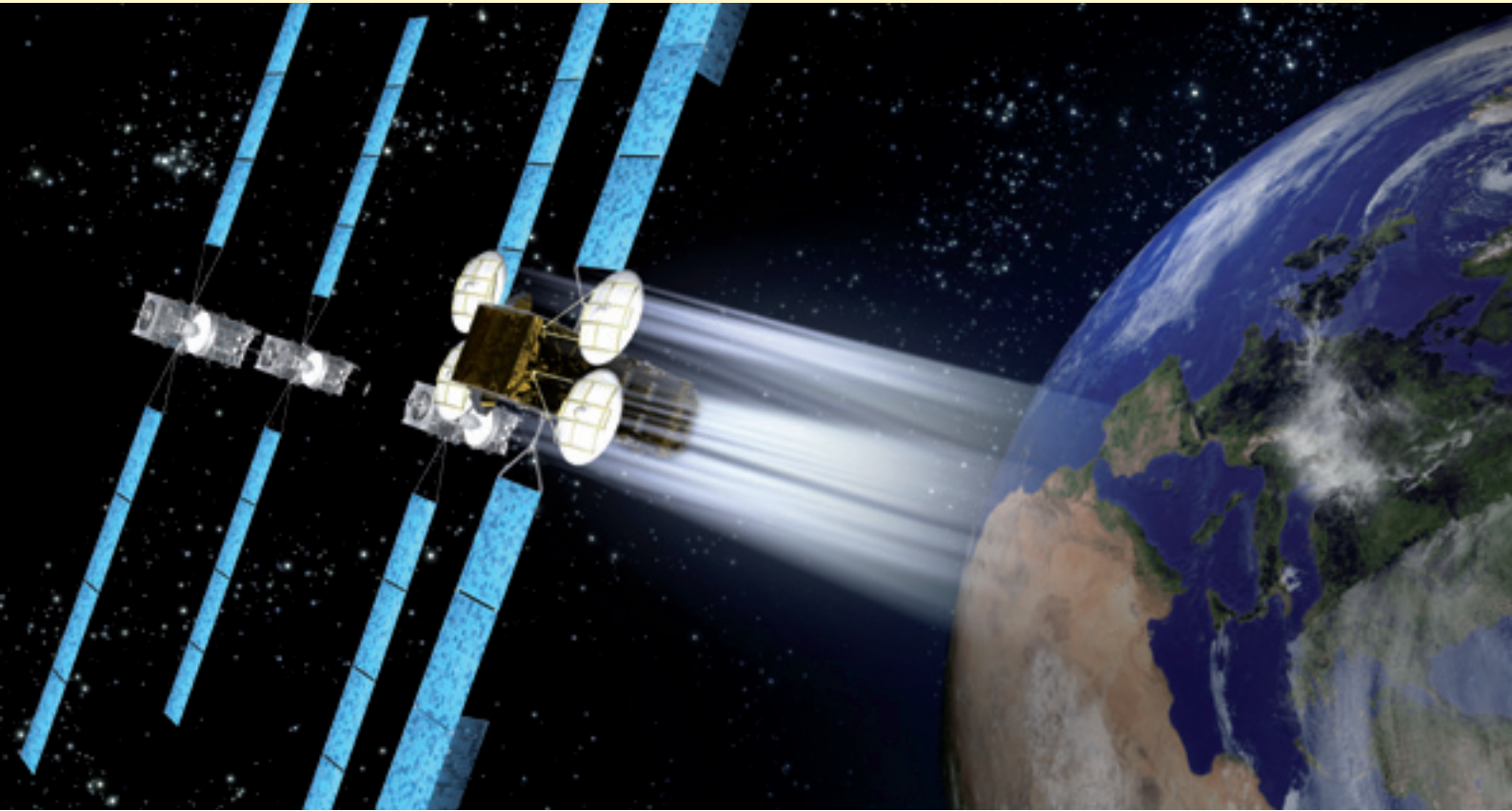
Public authorities and organizations with security tasks as well as operators of critical infrastructure, for example from the energy or transportation sector, are particularly dependent on secure communication.

Due to the transmission security and independence from terrestrial networks, the transport medium 'satellite' gains more and more significance.

To meet this demand, the companies Rohde & Schwarz SIT GmbH and Hiltron GmbH developed the Secure Portable SatCom Terminal (H-SPST) within a cooperation project, for secure data transmission (voice, audio and video).

CONTACT

Cluster Initiative	Deutsches Zentrum für Satellitenkommunikation e.V. (DeSK)
Cluster Manager	Dilara Betz
Address	Schillerstraße 34, 71522 Backnang
Telephone	+49 (0)7191 - 187 83 - 14
Website	http://www.desk-backnang.de



The KA-SAT Eutelsat satellite brings high-speed Internet with up to 20 Mbit/s to all those regions in Germany that don't have access to broadband connections.



The H-SPST was introduced to representatives from industry at the 3rd national conference 'Satellite Communications in Germany', held in Bonn in 2012. On a national level, this biennial conference is the most important branch-specific event. DeSK was participating at this opportunity with its own booth. Within this framework, both companies had the possibility to present their new joint product. For an efficient use of the valuable satellite bandwidth, the compact and portable terminal offers high-class Ethernet-

based data encryption. The terminal is directly integrated into a satellite-based transmission network with flexible topology. An integrated encoder ensures secure mobile access to the home LAN, from almost anywhere in the world.

This cooperation demonstrates the benefits of a professional cluster management, supporting for example the initiation of joint projects or the intensification of knowledge transfer within an initiative.

The compact and portable terminal provides satellite-based, high-quality data encryption.



The idea for the product came up during a DeSK networking event. Our cooperation with HILTRON was supported by DeSK in an exemplary manner.

Peter Rost, Head of Product Management and Marketing, Rohde & Schwarz SIT GmbH



„Smart“ reagent cartridge for more testing efficiency in in-vitro diagnostics

Nowadays, most in-vitro diagnostic test parameters are determined in laboratories using fully automated analysing systems based on wet-chemical testing procedures. Testing reagents are usually stored in bottles or in testing cartridges on the instruments. They are filled into the respective reaction vessels (cuvettes) using pipettors and the test reactions are mostly performed in these cuvettes as well.



We congratulate the team on their Roche Professional Diagnostics Inventor Award 2013. Early coordination and close cooperation of the project partners resulted in new solutions.

Dr. Christine Neuy, Microsystems Technology Baden-Württemberg

Complex robot systems allow fully automated process steps to carry out in-vitro diagnostics, for example the dosing of the reagents. However, the usual pipetting systems reach their limits when only tiny and very precise volumes of fluids are required.

The joint solution: development of a „smart“ reagent cartridge.

The MicroTEC South-West leading-edge cluster initiated the joint project „Smart Reagent Dosing“ in which several industry and academic research institutions are involved.

The partners cooperated closely and developed new dispensing technologies that may be integrated into single-use reagent cartridges and which are cost-efficient in production. A demonstrator based on one of these technologies was developed to replace the usual pipetting step of dispensing through a reagent cartridge. This not only allows non-contact dosing but also the dosing of the tiniest volumes from several microlitres to 100 nanolitres, which is highly precise within a single second. For example, the deviation for dosing 500 nanolitres of water is less than one percent!

The reagent container can be designed as a closed container so that even opened containers can stay on the device for a longer period because the closed design retards the gas exchange with the environment which otherwise impairs the reagent's stability.

The joint project Smart Reagent Dosing has the potential to contribute significantly to increasing the testing efficiency of in-vitro diagnostics and to reducing the costs per analysis. This technology can also be applied in other industries and areas. Six patent applications have been filed already

CONTACT

Cluster Initiative	MicroTEC Südwest managed by MST BW Mikrosystemtechnik Baden-Württemberg e.V.
Cluster Manager	Dr. Christine Neuy
Address	Emmy-Noether-Straße 2, 79110 Freiburg
Telephone	+49 (0)761 - 38 69 09 - 12
Website	http://www.microtec-suedwest.de

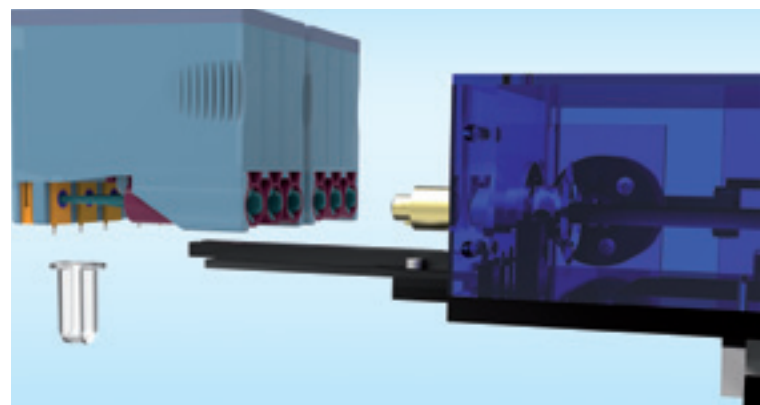


Illustration of a reagent cartridge with integrated dispenser and external actuator.



Typical reagent cartridge for current in-vitro diagnostic laboratory systems.

to turn technological leadership into economic success on a broad basis.

Ground-breaking innovation – the result of trusting cooperation between competent partners.

The MicroTEC South-West leading-edge cluster actively promoted Roche Diagnostics' participation in the project and supported cooperation negotiations with the research institutions. Within the „Health Beacon“ initiative of the

MicroTEC South-West leading-edge cluster, the team from Roche Professional Diagnostics in Mannheim, together with scientists from the University of Freiburg and the specialists in measuring technology of the Hahn-Schickard-Gesellschaft in Villingen-Schwenningen, developed innovative dosing concepts for in-vitro diagnostics.

This is an interesting cooperation with potential for further innovations.

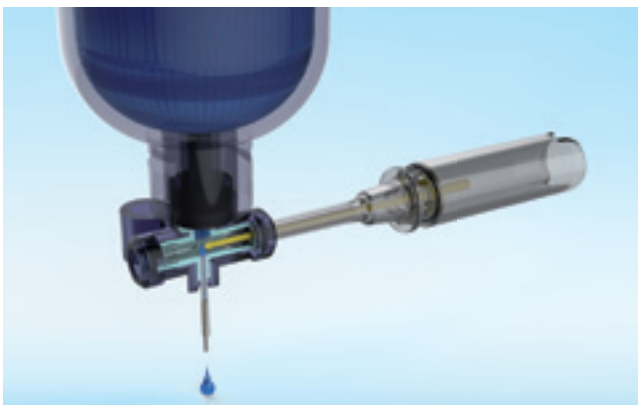


Illustration of a dispenser developed within the project.



The results of the project have exceeded our expectations by far and can be ascribed to the open, competent and very close cooperation of the project partners.

Dr. Jürgen Spinke,
Roche Diagnostics GmbH

Safe processes for testing textile nanomaterials

Today, nanoparticles are used to produce fascinating products with new functionalities, for example dirt-repelling or antibacterial textiles. However, as with any new technology, their safe application is of top priority. The producers and users of such high-tech products alike therefore have a strong interest in making nanoparticles harmless for man and the environment – and this is over their entire product life-cycle. For a better risk assessment regarding textile nanoproducts, the TechnoTox research project was launched in December 2010.

The project initiated by AFBW – Alliance for Fibre-Based Materials Baden-Württemberg– and supported by the Baden-Württemberg Ministry of Finance and Economics deals with the issue of nanotoxicology with respect to textiles. It examines whether nanofunctional textiles are safe for man and the environment. For this, the project team



TechnoTox demonstrates AFBW's interdisciplinary approach: Ideas are developed, discussed and realised with the partners from the textile value-adding chain..

Ulrike Möller, Network Manager,
Alliance for Fibre-Based Materials
Baden-Württemberg

collected data on the fate and behaviour and the biological effects of nanofunctional fibre-based materials subject to different ambient conditions and it carried out an exemplary risk assessment. In the course of these examinations,

methods were developed that allowed the detection and characterisation of nanoparticles and also their evaluation with respect to any potential existing human or ecotoxicological hazards for the environment.

A networking alliance of responsible partners.

The project is carried out in close cooperation between science and industry. Project partners are the Institute of Textile Technology and Process Engineering (ITV), the Hohenstein Institute for Textile Innovations and companies from various industries – from chemistry to material and textile processing companies.

Industry partners are, for example, CHT R. Beitlich GmbH, Textilchemie Dr. Petry, albnano AG, RAS Materialien, Mattes & Ammann GmbH & Co. KG, Lindenfarb Textilveredlung, Fiber Engineering GmbH and Junker Filter GmbH.

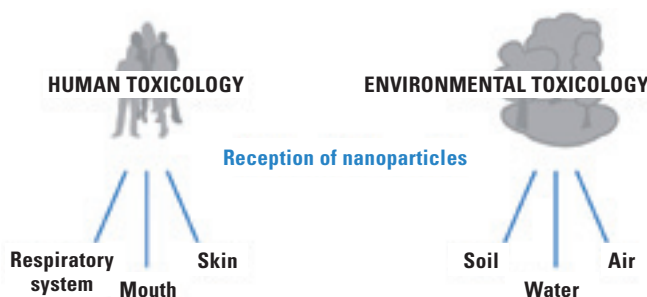
The project concept is to support a responsible use of nanotechnology and to strengthen the competitiveness of companies producing nanoproducts and nanomaterials or processing nanofunctional materials.

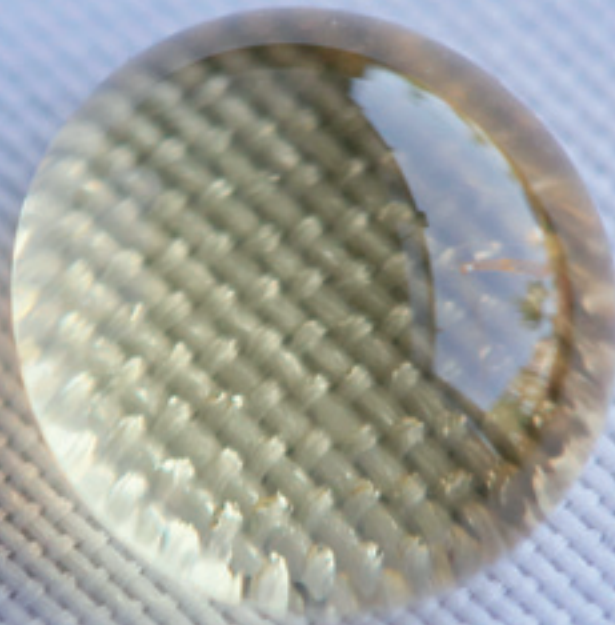
CONTACT

Cluster Initiative	State-wide Network AFBW – Allianz Faserbasierte Werkstoffe Baden-Württemberg e.V.
Cluster Manager	Ulrike Möller
Address	Gerhard-Koch-Str. 2 - 4, 73760 Ostfildern
Telephone	+49 (0)711 - 32 73 25 13
Website	http://www.afbw.eu



Illustration of how harmful substances enter the body or the environment.

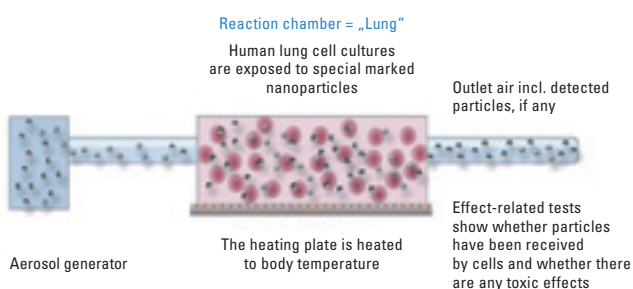




Top priority: safety for man and the environment.

A complementary approach was chosen to achieve the project goal which included that physical material examinations were directly combined with effect-related biological examinations for the purpose of exposure. Identifying particle properties and particle effects on real products

A lung model is used to examine whether nanoparticles can enter the body through inhaled air.



Nanofunctional textiles repel water and dirt.

allowed a comprehensive hazard and risk assessment for nanotechnologically functionalised fibre-based materials in consumer products. This is a development that contributes to a more confident assessment of such high-tech products and is therefore beneficial for man and the environment.



TechnoTox answers urgent questions about the safety of nanotechnology so that we can provide competent answers to our customers and drive innovations.

Dr. Harald Lutz, Head of Innovation and Service, Central R&D, CHT R. Beitlich GmbH



Virtual planning of industrial plants

Expansions, repairs or renewals of industrial plants require detailed planning. They are to be completed in ever-shorter periods of time – and at lower costs. Traditional planning methods are hardly able to fulfil these requirements. Companies therefore increasingly rely on smart, extremely speedy and efficient technologies such as 3D laser scanning and virtual reality.

3D laser scanning represents the most precise method of measurement and documentation. Within just a few minutes, geometrical data of open areas, building structures or process technology can be collected. The collected 3D data (scatterplots consisting of measurement points) is then transferred to 3D models on the computer which can be inspected and edited in the virtual reality.



Cooperation within the cluster made virtual reality applications a big option in plant engineering as a whole.

Dr.-Ing. Dipl.-Kfm. Christoph Runde,
Managing Director of
Virtual Dimension Center Fellbach

This is a great advantage, for example, if the plant location is part of a building or infrastructure that may be decades-old. There may not exist any documents that can be processed electronically or not at all – or they may lack the necessary quality. Often, modifications or installations are not documented. If there are new requirements for increa-

sing efficiency or for environmental constraints, laser scanning can provide a reliable planning basis for so-called revamp and revision processes. 3D laser scanning is even more valuable because it collects all the necessary data, creates a virtual picture of the industrial facility and provides a reliable planning basis.

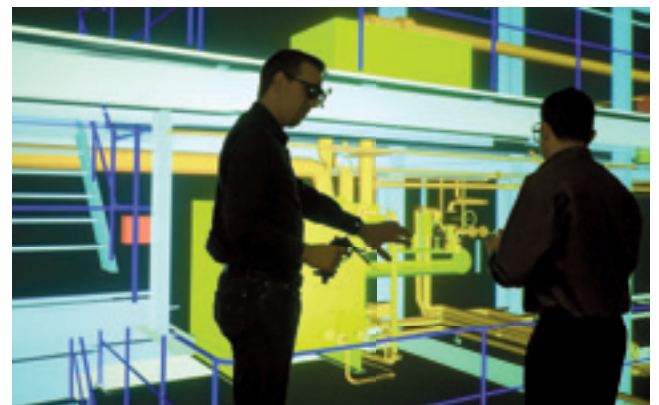
Virtual Reality (VR) represents an excellent tool for analysing 3D data. This allows direct statements based on the intuitive opinions of experts. Specific IT knowledge is not required because conclusions can be drawn based on what is visible. All relevant disciplines can thereby be integrated into the planning process.

Successful cooperation in the cluster opens up new dimensions.

The member companies of the Virtual Dimension Center, virtual reality specialist ESI Group and laser scanning expert scantec 3D, have joined forces to allow the analysing and editing of huge laser scanning data volumes in VR. For this purpose, they developed interfaces, graphic renditions and editing methods that allow the uploading of scatterplots from the laser scanner and their adjustment

C O N T A C T

Cluster Initiative	Virtual Dimension Center (VDC)
Cluster Manager	Dr.-Ing. Dipl.-Kfm. Christoph Runde
Address	Auberlenstraße 13, 70736 Fellbach
Telephone	+49 (0)711 585 309 - 0
Website	http://www.vdc-fellbach.de
Project	http://www.icido.de/de/Maerkte/Anlagenbau



Virtual reality in plant engineering at the Virtual Dimension Center (VDC).



Planning discussion at a virtual machine model that also considers ergonomic aspects.

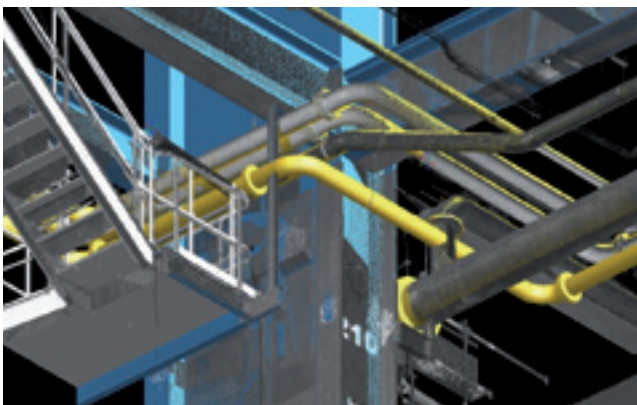
to a new geometry that is being planned. This is to prevent collisions or spaces being occupied by more than one component. Expensive planning faults or time-consuming manual reverse engineering can be avoided in the future.

Marketable development for effective planning.

The newly created software solutions were made ready

for the market by the ESI Group, in two modules for the IC.IDO software: one for the visualisation of laser scanning scatterplots and the other one for visualising extremely large data records.

The results of this cluster cooperation also show new and useful applications for VR in the entire field of plant engineering.



Combined presentation of existing and planned parts (laser scan scatterplot).



Combining the technologies of virtual reality and laser scanning clearly improves planning reliability for operating and manufacturing companies, especially in the area of plant engineering.

Michael Fritsch, Key Account Manager – IC.IDO Virtual Reality, Engineering System International (ESI) GmbH

More quality of life – „titanium plastic“ for spine implants

The Constance-based Orthobion GmbH develops new biomaterials to be used in spine implants. To overcome the disadvantages of current implants, they combined different materials. This resulted in the new „titanium plastic“ material FGOIC^{Ti}-PEEK. The development was enabled by their cooperation with the University of Constance, which was initiated by the BioLAGO cluster initiative.

The growing number of slipped disks and other problems in many cases requires the use of implants. Increasing life expectancy also contributes to this increasing demand.



We are glad that we could help create an innovative product ready for the market by making this contact.

Andreas Baur, Executive Manager, BioLAGO

To date, spine implants were either made of titanium or plastic. Both materials have their individual advantages but also disadvantages. On the one hand, titanium is much stronger than bone material which may lead to bone damage after implanting. Moreover, the radio-opaqueness of titanium is problematic for imaging techniques.

Although the frequently used plastic material polyetheretherketone (PEEK) features more favourable mechanical

properties and is radio-transparent, the fact that surrounding bone cells can barely adhere to it greatly impairs stable integration of the implant. Therefore, combining the advantages of both materials seemed to suggest itself and Orthobion developed a plastic implant with a functional surface.

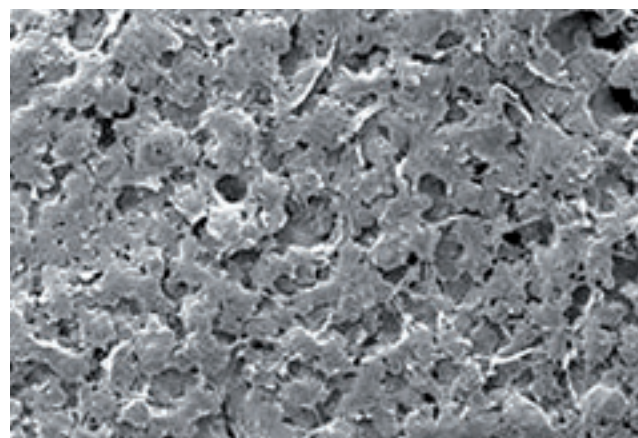
Intensive development cooperation resulted in custom-tailored solution.

The key to success was the coating of the plastic material with titanium. However, traditional methods were not suitable for producing a sufficiently thin layer. To realise this special coating, Dietmar Schaffarczyk, Managing Director of Orthobion, sought academic advice and assistance and contacted the regional industry network BioLAGO.

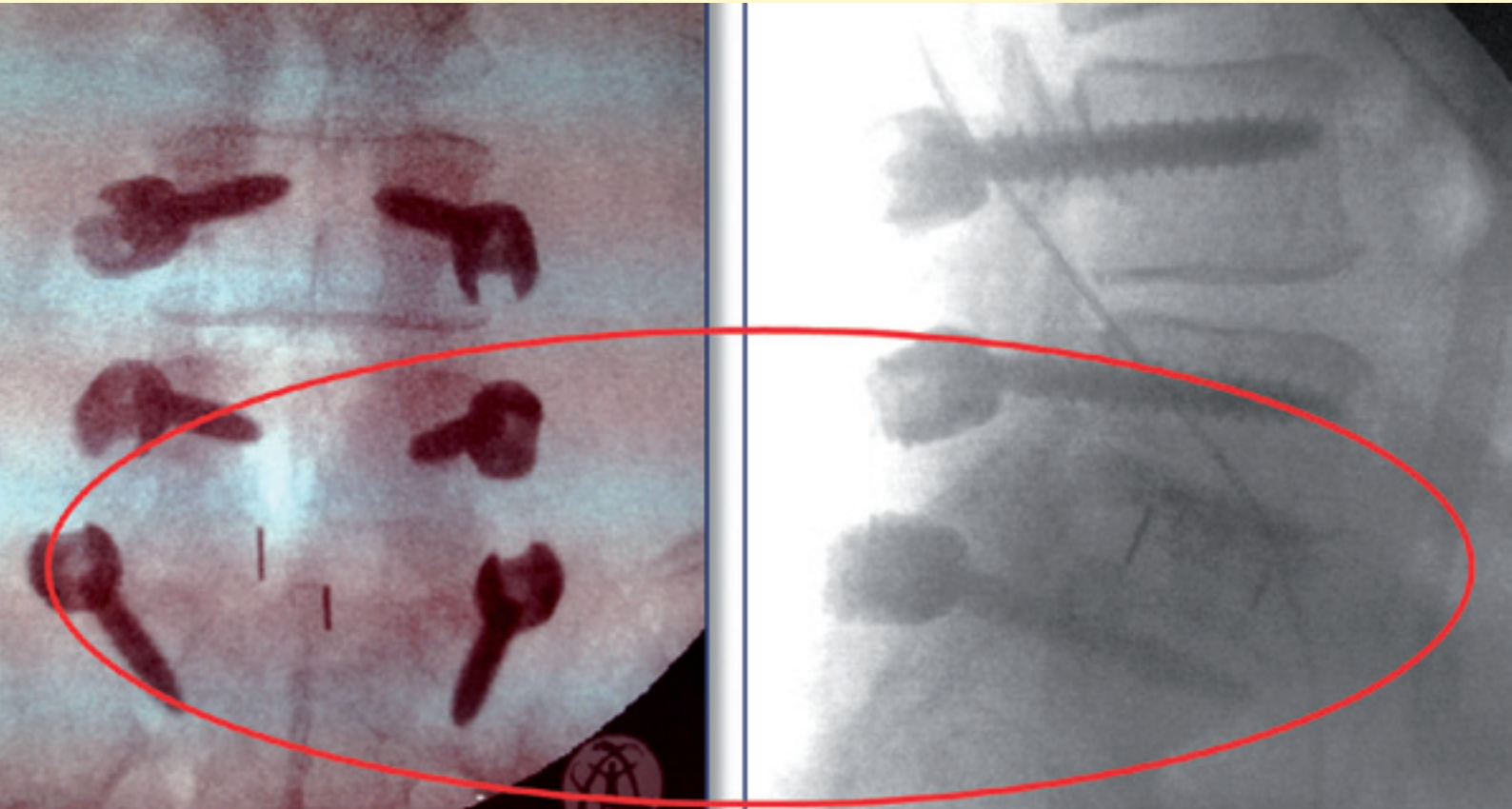
Quickly and without any fuss, contact was made with Professor Dr. Schatz (University of Constance) from the Steinbeis Transfer Centre for Nanostructures and Solid State Analytics. Cooperation started and within a short period of time, they were able to develop a method for titanium coating on the nanometre scale.

C O N T A C T

Cluster Initiative	BioLAGO e.V. – life science network
Cluster Manager	Andreas Baur
Address	Byk-Gulden-Str. 2, 78467 Konstanz
Telephone	+49 (0)7531 - 284 - 27 22
Website	http://www.biolago.org



Tightly-woven osteoblast structure on coated implant surface.

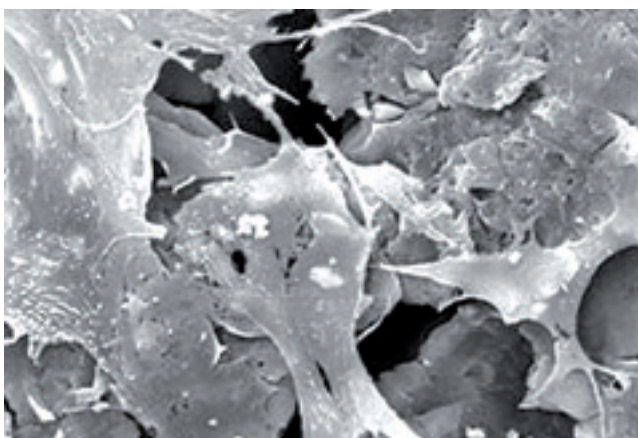


Spine implants made of FGOIC^{Ti}-PEEK combine the cell-attracting material properties of titanium and the mechanical and optical advantages of medical plastic. These implants speed up bone integration and, since they are radio-transparent, allow doctors to observe their integration and the postoperative healing process without any disturbing artefacts.

New material speeds up the healing process.

The new titanium-plastic material affects the stable development of a bone bridge between the vertebral body and the implant while being almost fully radio-transparent. This helps to achieve a speedy healing process without impairing the postoperative methods of analysis. A welcome side effect of this development: Follow-up

costs are reduced so that the health sector in general benefits from a significant savings potential. After the advantages of titanium-PEEK implants had been confirmed in cell and animal tests, they by now received approval for use in the area of the cervical, thoracic and lumbar vertebrae. This is a success story that was made possible through cluster membership.



Osteoblasts aggregate on a coated implant surface.



BioLAGO quickly made the necessary contacts to test the feasibility of our idea, the „new“ titanium plastic. In the meantime, implants made of this plastic have received approval for marketing.

Dietmar Schaffarczyk, Managing Director of Orthobion GmbH

How do I find the right cluster initiative that matches my company?

Would you like to follow the examples in this brochure and also participate in a cluster initiative with your company? Are you asking yourself how you can find a matching cluster initiative for your company? It is quicker than you'd expect. Here are some tips and contacts.

One option is to speak to communal or regional business development organisations. Ask your municipality, district office or regional administration for the right contacts.

You may also contact the Chamber of Commerce and Industry or the Chamber of Crafts responsible for your region. They have special innovation consultants that will be glad to help you.

In each of the twelve regions of the state, there are more competent contacts available, the Regional Cluster Contacts.

It is also always a good idea to have a look at the cluster portal's database at www.clusterportal-bw.de. Look for your respective field of technology and find out which cluster initiatives there are in your region.

Another option is, of course, to contact other companies with which you have close business relations. Ask if they participate in any innovation network and what their experiences are.

Once you have collected initial information, you should speak to

- the cluster manager of the cluster initiative that you consider an interesting option for your company and
- with representatives from at least one company who is an active member of this cluster initiative.

To validate your first impression, we recommend attending one of their standard network meetings.

We are sure that you will find the right cluster initiative for your company in the end, to assist and support you in launching your successful product, process and service innovations in the future.

Congratulations!

Region	Cluster contact	Business development organisations	Chamber of Commerce and Industry Chamber of Crafts
Bodensee-Oberschwaben	grieb@wf-bodenseekreis.de	www.wf-bodenseekreis.de www.wir-rv.de www.wis-sigmaringen.com	www.weingarten.ihk.de www.hk-ulm.de www.hwk-reutlingen.de
Donau-Iller	puerckhauer@ulm.ihk.de	www.innovationsregion-ulm.de	www.ulm.ihk24.de www.hk-ulm.de
Südlicher Oberrhein	michael.richter@fwtm.freiburg.de	www.fwtm.freiburg.de www.wrf-freiburg.de www.wro.de	www.suedlicher-oberrhein.ihk.de www.hwk-freiburg.de
Heilbronn-Franken	a.schumm@heilbronn-franken.com	www.heilbronn-franken.com www.wfgheilbronn.de www.wfgonline.de	www.heilbronn.ihk.de www.hwk-heilbronn.de
Hochrhein-Bodensee	sabine.lauffer@wsw.eu	www.wsw.eu www.bodensee-standortmarketing.com	www.konstanz.ihk.de www.hwk-konstanz.de www.hwk-freiburg.de
Mittlerer Oberrhein	steffen.buhl@wifoe.karlsruhe.de	www.karlsruhe.de/b2/wifoe.de www.trk.de www.wfg-bruchsal.de	www.karlsruhe.ihk.de www.hwk-karlsruhe.de
Neckar-Alb	nawroth@reutlingen.ihk.de	www.tuebingen.de/wit www.reutlingen.de www.wtg-rottenburg.de	www.reutlingen.ihk.de www.hwk-reutlingen.de
Nordschwarzwald	schoch@nordschwarzwald.de	www.nordschwarzwald.de	www.nordschwarzwald.ihk24.de www.hwk.karlsruhe.de www.hwk-reutlingen.de
Ostwürttemberg	bilger@ostwuerttemberg.de	www.ostwuerttemberg.de	www.ostwuerttemberg.ihk.de www.hk-ulm.de
Rhein-Neckar	klemens.groeger@m-r-n.com	www.m-r-n.com www.mannheim.de www.heidelberg.de www.rhein-neckar-kreis.de www.wirtschaft-nok.de	www.rhein-neckar.ihk24.de www.hwk-mannheim.de
Schwarzwald-Baar-Heuberg	wolf@vs.ihk.de	www.wirtschaftsfoerderung-sbh.de www.wifoeg-vs.de	www.schwarzwald-baar-heuberg.ihk.de www.hwk-konstanz.de
Stuttgart	stephanie.fleischmann@region-stuttgart.de	www.wrs.region-stuttgart.de	www.stuttgart.ihk24.de www.hwk-stuttgart.de

Head offices of presented cluster initiatives



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Cluster GREENCITY FREIBURG

I



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Editor

Ministry of Finance and Economics
Baden-Württemberg
Neues Schloss, Schlossplatz 4, 70173 Stuttgart
Telephone +49 (0)711 - 123 - 0
www.mfw.baden-wuerttemberg.de

Editorial office

Ministry of Finance and Economics
Baden-Württemberg
Cluster policy unit, regional economic policy
Telephone +49 (0)711 - 123 - 22 40
E-Mail: cluster@mfw.bwl.de
www.clusterportal-bw.de

Design and layout

Grafik-Design Klaus Killenberg, 70597 Stuttgart

English Translation

Seelos Sprachendienste, Regina Seelos, Flein
Michel TradukServo, Gisela Michel-Neuroth,
Villingen-Schwenningen

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Ministerium für Finanzen und Wirtschaft
Baden-Württemberg, Pressestelle
Schloßplatz 4, 70173 Stuttgart
Fax +49 (0)711 - 123 - 48 04
E-Mail: pressestelle@mfw.bwl.de

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