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EARTO
INNOVATION AWARDS 2023

Technology for a better world

www.earto.eu

EARTO - European Association of Research and Technology Organisations

Founded in 1999, EARTO promotes Research and Technology Organisations (RTOs) and represents their interest in Europe. EARTO network counts over 350 RTOs in more than 31 countries. EARTO members represent 150,000 highly-skilled researchers and engineers managing a wide range of technology infrastructures.

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GLOBAL CHALLENGES
EUROPE'S
INDUSTRIAL COMPETITIVENESS
EUROPEAN RESEARCH AREA

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15 EARTO INNOVATION AWARDS YEARS

EARTO INNOVATION AWARDS 2023

From the lab to your everyday life. RTOs innovate to improve your health and well-being, your safety and security, your mobility and connectivity. RTOs' technologies cover all scientific fields. Their work ranges from basic research to new products and services' development. RTOs are non-profit organisations whose core mission is to produce, combine and bridge various types of knowledge, skills and infrastructures to deliver a range of research and development activities in collaboration with public and industrial partners of all sizes. These activities aim to result in technological and social innovations and system solutions that contribute to and mutually reinforce their economic, societal and policy impacts.

58 RTOs

363 APPLICATIONS

23 COUNTRIES

APPLICATIONS SO FAR

16 COUNTRIES

WINNERS SO FAR

19 RTOs

69 WINNERS

IMPACT DELIVERED

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are today on the market and have proven their impact.

IMPACT EXPECTED

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are not yet on the market as a final product/service but promise to have a great impact.

THE AWARD COMPETITION IS ADJUDICATED BY AN INDEPENDENT JURY

Juan Antonio Tébar
Director, CDTI

Salla Saastamoinen
Deputy Director General,
DG Joint Research Center,
European Commission

Christian Ehler
Member of the
European Parliament

Jana Kolar
Executive Director,
CERIC-ERIC & Chair, ESFRI

Dave Wilkes
Director, Innovate UK

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Discover
more innovations
from RTOs

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UAR / LCM

Upper Austrian Research GmbH (UAR) is the leading organisation for non-university research in Upper Austria. It promotes innovative solutions and provides access to excellent R&D capabilities.

LCM, the Linz Center of Mechatronics, is a Research and Technology Organisation in mechatronic technology, supporting its industrial partners up to the product implementation.

eVSP: Full speed to zero emissions

The shipping industry causes 4-6% of global CO_2 emissions and urgently needs to decarbonise. Highly maneuverable ships (service ships, tugs, ferries, etc.) often use Voith Schneider Propellers (VSP) for propulsion. The overall efficiency is reduced when frequently operated in partial load. In the presented project, Voith, ELIN Motoren, and the Linz Center of Mechatronics, EARTO member through UAR, developed the electrically propelled eVSP.

INNOVATION

The eVSP relies on electric direct drive motors to power the propeller. The first version has a 1.8MW motor mounted inside the ship hull on top of the propeller. High demands regarding lifetime, thermal stability, efficiency, and robustness have been fulfilled using extensive multi-physics optimisation. The resulting eVSP boosts efficiency in all load scenarios, reduces lubrication oil, and drastically lowers noise emissions.

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The first ships with eVSPs took to the sea in 2021, achieving remarkable performances: The 80m service vessels for offshore wind platforms operate silently, with fuel savings of 370t of marine diesel per year. In the long run, fuel cells or other renewable energy sources shall replace the current diesel generators, leading to true zero-emission-shipping. More than 42 ordered units demonstrate the market success and the high impact of the eVSP towards SDG 13 (Climate Action), SDG 14 (Life below water), and SDG 9 (Industry & Innovation).

UAR
www.uar.at

LCM LINZ CENTER OF MECHATRONICS
www.lcm.at

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TNO

TNO, an independent Dutch RTO, has some 3,200 professionals who put their knowledge and experience to work in creating smart solutions to complex issues.

Wireless solutions for predictive maintenance of critical Infrastructures

Transportation, energy, and industrial infrastructures play a pivotal role in the efficient functioning and sustained growth of any economy. Examples of critical infrastructures are roads, bridges, and power generation plants, that directly support the daily activities of citizens and businesses. In Europe, infrastructures are in need of extra attention due to aging and high levels of utilisation. Maintaining the safety and reliability of these critical assets in the coming years requires a transition from traditional periodic maintenance approaches to more advanced predictive schemes.

INNOVATION

"SHM NEXT", a spin-off from EARTO member TNO, provides an innovative prognostic digital twin system which performs structural health assessment of civil and industrial infrastructures and is composed of wireless sensor nodes for damage monitoring, damage prognosis software, and VR-assisted visualisation. The unique architecture of this digital twin makes the solution scalable, highly reliable, and suitable for large-scale assets.

IMPACT DELIVERED

The widespread application of this technology in European civil and industrial infrastructures will have significant positive social, environmental, and economic impact. Continuous evaluation of assets without interruption of operation in a remote, quantitative, and prognostic manner can enable safer, cheaper, and more efficient utilisation of the assets.

IMPACT
DELIVERED

PRIZE
3 RD

CEA / DIABELOOP

CEA is a key research and innovation player in low carbon energies (nuclear and renewable), digital technologies, technologies for the medicine of the future, defense and security.

Diabeloop develops innovative solutions, integrating therapeutic artificial intelligence, to automate the treatment of type 1 diabetes.

Diabeloop: interoperable self-learning diabetes management solutions

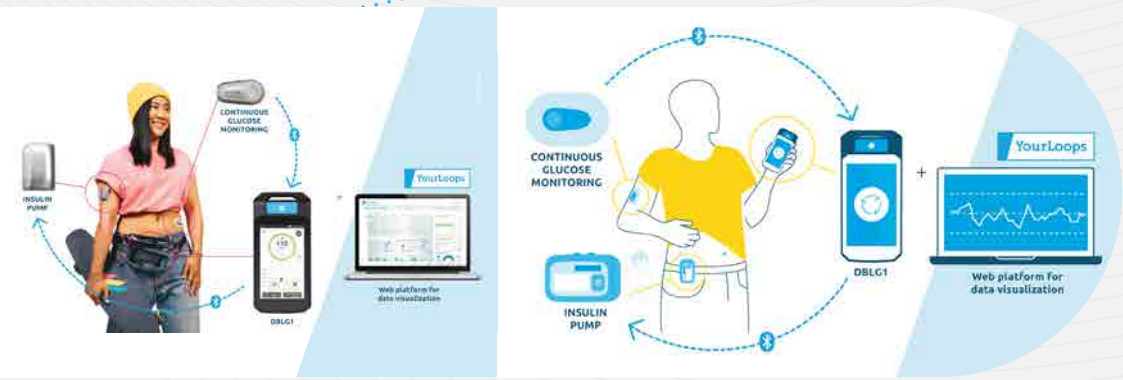
People living with type 1 diabetes are constantly at risk of either hypoglycemia or hyperglycemia. To manage the disease, they must perform countless insulin dose calculations every day. And, depending on metabolism, physical activity, and diet, the doses can vary by a factor of three. Diabeloop's system lightens this mental load, improves the regulation of glucose levels and patients' quality of life.

INNOVATION

Diabeloop is a spin-off from EARTO member CEA which has developed a first-of-its-kind solution for automated type 1 diabetes treatment. It calculates everyday multiple times the insulin dose by continuously monitoring the patient's glucose level, calculating the right insulin dose needed throughout the day and administering it in an automated and personalised manner.

IMPACT DELIVERED

Diabeloop is life-changing for diabetic patients enabling them to maintain a normal life by lightening the mental load of diabetic patients and improving their quality of life.



www.cea.fr

www.diabeloop.com

NEMOSINE - Smart packaging to extend useful life and improve preservation of cinematographic and photographic heritage

Currently, more than 75 years of visual and sound memories, among which there are films, photographs, posters and slides, produced between 1895 and 1970, are at preservation risk. Manufactured with cellulose acetate (CA) and cellulose nitrate (CN), these valuable memories could disappear due to the natural instability of the materials with which their formats were manufactured.

Innovation: The NEMOSINE project, coordinated by EARTO member AIMPLAS, the Plastics Technology Centre, created a new smart packaging that extends the life and improves the preservation of these cultural items. The NEMOSINE box consists of packaging containing material that adsorbs acetic acid released by the cellulose, sensors that detect acetic acid and nitrogen dioxide, a module for wireless communication and software to monitor these emissions and generate a degradation model for decision-making on preservation.

Impact Delivered: This new system improves the traditional storage solutions, such as the cold preservation (under 5ºC), by means of the development of an innovative, more efficient and sustainable packaging. The NEMOSINE box helps to reduce the energy consumption and costs and extends the preservation period.

AIMPLAS, the Plastics Technology Centre, has more than 30 years of experience in the plastics industry, providing added value to companies so they can create wealth, and to meet societal challenges to improve people's quality of life and ensure environmental sustainability.

www.aimplas.es

The digital super-expert putting gemstones under the microscope

Gemtelligence in cooperation with EARTO member CSEM, Gübelin Gem Lab developed a platform determining the origin and treatment of coloured gems using deep learning. With this innovative technology, which serves the entire industry, the Gem Lab revolutionises the way that gemmology interprets data. The increased analytical consistency and precision promise enhanced security and trust. This is a major benefit for end customers as well as jewellers, collectors, investors along with the entire gem trade.

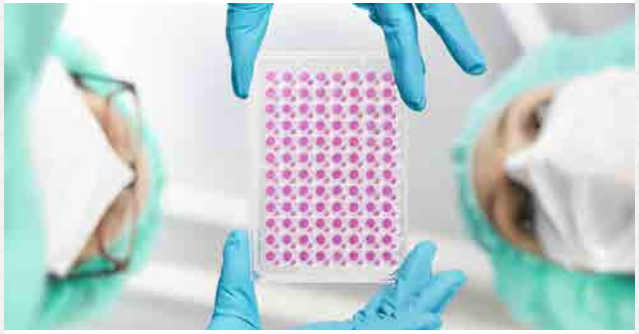
Innovation: For the first time, an algorithm based entirely on artificial intelligence (AI) determines the country of origin and recognises heat treatments of rubies, sapphires, and emeralds. The deep learning architecture relies on the latest scientific concept: a comprehensive AI system for evaluating a wide variety of analytical data. The training is based on a reference stone collection which has been collected over decades.

Impact Delivered: The solution is being successfully implemented in the three laboratories in Lucerne, Hong Kong and New York. Because of the simplicity and general applicability of the basic principle, and especially considering the variety of data structures which Gemtelligence can process, the application can be conceived in other fields where information is drawn from highly heterogeneous multimodal data.

CSEM is an internationally recognised Swiss technology innovation center developing disruptive technologies with a high societal impact, which it then transfers to industry.

www.csem.ch - www.gubelingemlab.com

Standardising organoids on a large scale for the first time



Industrialised with CSEM technological support, Gri3D® launched in 2018 by the Swiss start-up SUN bioscience enables the large-scale, standardised, rapid, and reliable production of 3-D in vitro organoid cultures from patient stem cells. Organoids play an essential role in the development of personalised medicine based on the patient's genetic profile.

Innovation: SUN Bioscience developed a new solution for culturing organoids from stem cells. Its innovative feature lies in the U shape of the microwells in which the cells are grown in hydrogel. EARTO member CSEM helped to industrialise the production of the Gri3D® platform. By developing a dedicated multi-well plate and robotic process, we succeeded in automating the production of the hydrogel microtopography in which the human stem cells can be seeded.

Impact Delivered: Gri3D® is deployed in 5 out of the 10 largest pharmaceutical companies. Gri3D® has been adopted by more than 200 customers across the world. Organoids such as the retina, intestine, brain, and pancreas have already been successfully produced and cultivated on the SUN bioscience platform. This groundbreaking, large scale standardisation of organoids represents a key advancement toward truly

CSEM is an internationally recognised Swiss technology innovation center developing disruptive technologies with a high societal impact, which it then transfers to industry.

www.csem.ch

Predictive quality control system for zero-defect textile production

PRECATEX Project has developed a set of highly innovative technological solutions that will impact the textile industry and the environment, harmonised with Industry 4.0 and the Circular Economy principles.

Innovation: This technological solution performs the analysis of the state of functional degradation of the most critical components of the process and proposes actions to be carried out by the operator in a non-intrusive manner, resulting in a fabric Brain Solution that manages the quality process. It is based on advanced photonic and IoT systems combined with artificial intelligence algorithms as well as a deep knowledge of the textile sector.

Impact Delivered: PRECATEX technology predicts very accurately, based on that detection in its elements, potential manufacturing problems to achieve a zero-defect fabric manufactured. Textile industry produce 92 tons of waste and 25% has origin during fabric manufacturing process with a direct impact of €18K fabric waste every 20 Tn and 75% defects detected by PRECATEX solution with €13.500 saved by stopping machine plus cost if continues the whole supply chain.

Portfolio: PRECATEX

Video: PRECATEX

eurecat

Eurecat is the largest cross-sectoral and trans-national RTO in Catalonia, Spain, with 700 professionals covering all technological specialities to deliver added value to our society.

www.eurecat.org

More crop per drop

Due to the steady increase in population, an estimated ten billion people will live on earth by 2050. According to the United Nations, humanity will then need about 50% more food than today. But even today, food security is threatened by droughts, water shortages, floods and other environmental disasters.

Innovation: EARTO member Fraunhofer proposes measuring the precise surface temperature from space at any point on Earth every 24 hours with a resolution of 50 meters. Effects of an impending drought on plants can thus be detected at an early stage and mitigated or even prevented by targeted irrigation. By using free-form metal optics and a patented image processing method, the small satellites can achieve much higher resolution than existing systems. The technology has been demonstrated on the International Space Station (ISS) in 2022.

Impact Delivered: By 2028, 16 satellites in Earth orbit are expected to support efficient irrigation of agricultural land. With Fraunhofer technology, it is possible to carry out such constellation missions using miniaturised satellites for a fraction of the cost. From 2026 onwards, 180 billion tons of water and 94 million tons of CO_2 could already be saved annually, while global crop yields could be increased by up to 4% without higher water consumption. This would be enough food for over 350 million people.

Fraunhofer

Fraunhofer EMI

Fraunhofer IOF

Fraunhofer EMI and IOF are two of the 76 institutes/research units of Fraunhofer, the world's leading RTO for applied research, experimental development and technology transfer.

www.fraunhofer.de - www.emi.fraunhofer.de - www.iof.fraunhofer.de

Synera - Connected Engineering Software & Platform for the efficient designof technical components

The development of technical components including load case analysis and optimisation of parts in respect of weight and stability is still characterised by fractionated product development chains including many recurring steps for similar components.

Innovation: At the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), EARTO member through the Helmholtz Association, developed a method of bionic light-structure optimization followed by the spin-off of Synera GmbH in2018. The Synera Connected Engineering Platform exhibits a holistic tool set for rapid component design and optimisation.

Impact Delivered: Synera shortens the development cycles for technical components by up to 90% and helps to safe up to 40% weight by bionic structure optimisation algorithms. With this holistic and powerful approach, Synera fundamentally and sustainably revolutionises the development of technical components.

HELMHOLTZ

AWI ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

AWI is the German Helmholtz Centre for Marine and Polar Research with strong dedication to multidisciplinary research, public outreach and knowledge and technology transfer.

www.helmholtz.de - www.awi.de

Flair suite: a package of innovations for industrial and environmental gas monitoring

With environmental constraints becoming more severe, the need for the industry to monitor and to know the nature of their effluents is crucial for addressing regulatory issues.

Innovation: EARTO member IFP Energies nouvelles (IFPEN) has developed Flair suite solution, a unique portable trace gas measurement system that is more efficient than the human nose when it comes to detecting, identifying, and interpreting gas anomalies. Particularly effective for detecting odour molecules such as H2S, SO_2, NH_3, mercaptans, THT or other molecules that absorb UV light, Flair suite is portable, drift-free gas measurement system that enables pollutant measurements on a much larger scale.

Impact Delivered: Flair suite alerts personnel in case of leak and keeps history of measures in relation to air quality control or in the event of a complaint. It can be used to improve operators' safety management capabilities contributing to create a better working environment. Flair suite enables the rapid identification of sources of nuisances, that if not detected quickly enough can affect the quality of citizens' lives and promote the depreciation of property values.

IFPEN is a major research and training player in the fields of energy, transport and the environment. From scientific concepts to technological solutions, innovation is central to its activities, hinged around four strategic directions: climate, environment and circular economy / renewable energies / sustainable mobility /responsible oil and gas.

www.ifpenergiesnouvelles.com

Futurol™ A new technology for valorisation of cellulosic lignocellulosic biomass

Lignocellulosic biomass, one of the world's abundant sources of carbon, is an attractive alternative to fossil feedstocks to produce biofuels, bioproducts and energy.

Innovation: EARTO member IFP Energies nouvelles (IFPEN), has co-developed Futurol™ technology for the optimal recovery of green carbon from lignocellulosic biomass into biofuels, bioproducts and energy, without competition with food and land uses. This technology combining chemical and biological conversions operates in an aqueous medium under mild conditions. Biocatalysts are produced within the process from co-products. Particular attention is address to the limitation of water consumption and to the return of unused green carbon, thus preserving the quality of the soil on which the lignocellulosic biomass is produced.

Impact Delivered: This innovation contributes to the reduction of greenhouse gases, particularly in the field of transport, the second largest source of emissions. It also contributes to the reduction of energy dependence and to the redeployment of economic activity in rural areas where industrial plants will be located near lignocellulosic biomass field. Launched in 2008, FUTUROL™ project brought together 11 major partners*. Genuine expertise was developed around FUTUROL™ project, with the support of Bpifrance confirming France's position as a leader in the bioeconomy.

* ARD, IFP Energies nouvelles, INRA, Lesaffre, Office national des forêts, Tereos,Total, Vivescia, Crédit Agricole Nord Est, CGB, Unigrains

IFPEN is a major research and training player in the fields of energy, transport and the environment.

www.ifpenergiesnouvelles.com

LIST – GRCC, an end-to-end platform for risk-based regulation management

Nowadays, regulations with a strong emphasis on cybersecurity and risk management are increasingly emerging at the EU level. They impose a risk-based approach on entire economic sectors, with regulatory authorities designated in each member state being in charge of the supervision and effective enforcement of these obligations.

Innovation: EARTO member LIST has designed a software platform for the end-to-end management of regulations concerning cybersecurity and risk management. The platform comprises a risk management module and an incident notification module used by regulated entities, and a data analytics module for the regulatory authority.

Impact Delivered: The GRCC platform is currently used by French and Luxembourgish companies for compliance purpose, especially in the frame of ISO/IEC 27001 and ISO/IEC 27557 certifications, as well as Data Protection Impact Assessment in the frame of the GDPR. Certified companies are able to manage their risks in accordance with the different requirements coming from the standards and regulations, and auditors are able to check the compliance with them directly within the platform.

The Luxembourg Institute of Science and Technology (LIST) is a mission-driven Research and Technology Organisation (RTO) active in the fields of materials, environment and IT.

www.list.lu

AudioMovie
A voice-over system for cinemas

Modern technical solutions offer support for persons with disabilities, assisting them in participation in many areas of social life, including cinema shows. AudioMovie is an application which assists persons with visual and hearing impairments, dyslexia, and all those who find reading subtitles challenging, in participation in regular cinema shows. It allows to reproduce audio description and audio subtitles in cinemas, giving access to soundtracks (voice-over, dubbing) in several languages.

Innovation: AudioMovie provides audio description in the form of an audio stream to the end user's mobile device (smartphone or tablet) and synchronises it in real time with the movie. The system features a portal providing access to audio description and audio subtitles, a tool for preparing and recording the audio description, and legal solutions concerning the copyright of the presented content.

Impact Delivered: In the research conducted for the AudioMovie project, persons with visual impairment stated that they want to go to the cinema for standard movie screenings, not for occasional special screenings. AudioMovie prevents social and cultural exclusion of persons with disabilities, particularly visual impairments, who with the application's assistance can participate in regular cinema shows. This is the way it works in cinemas which use AudioMovie – the solution is now available in 13 cinemas in Poland.

Łukasiewicz

AudioMovie

The Łukasiewicz Research Network is one of the biggest research networks in Europe, with 7,000 staff and 22 research institutes in 12 cities across Poland.

www.lukasiewicz.gov.pl

Determination of biomass content by the C14 radioisotope method using the benzene synthesis line or the combustion method

CO_2 emissions into the atmosphere are a problem that every country in the European Union is currently facing. We try to reduce emissions from fossil fuels by replacing them with renewable energy sources, one of which is biomass. Not every biomass is easy to identify, it requires appropriate instruments and research methods.

Innovation: EARTO member Łukasiewicz Research Network – Institute of Ceramics and Building Materials offers a service for determining the content of biomass fraction in solid and liquid fuels, currently improving this technology which will allow for determination of biomass content in various materials. The marking can be used to determine CO_2 emission factors for the purposes of the EU ETS, KZR, or to control the content of bio-based substances at gas stations.

Impact Delivered: Determination of the biomass content leads to a reduction in the production costs of, for example, cements, which has a direct impact on the cost of the final product, and also reduces costs in the entire construction sector. In addition, money saved in "zero CO_2 emissions" are used to invent new ways to fight CO_2. The service can be used to obtain a certificate, e.g. "OK bio-based". The service is aimed at the European market, but other markets are not excluded.

Łukasiewicz
Institute of Ceramics
and Building Materials

The Łukasiewicz Research Network is one of the biggest research networks in Europe, with 7,000 staff and 22 research institutes in 12 cities across Poland.

www.lukasiewicz.gov.pl - www.icimb.lukasiewicz.gov.pl

LIGHTCOPanel - Fully mineral lightweight load-bearing concrete sandwich panel including insulation and enhanced functionalities

EARTO member RISE has developed an innovative construction material called LIGHTCOPANEL, a fully mineral load-bearing lightweight concrete sandwich panel including insulation with
enhanced functionalities.

Innovation: LIGHTCOPanel is made of an inner layer of self-compacting concrete with construction demolition waste aggregates, a prefabricated insulation layer of cellular lightweight concrete with a thermal conductivity of 0.039 W/(m.K), and an external layer of selfcompacting concrete also with CDW aggregates and reinforced with carbon textile. This innovative sandwich panel is lightweight, durable, fully recyclable, and highly energy efficient.

Impact Delivered: LIGHTCOPanel has a positive impact on three United Nations SDGs: Industry, Innovation and Infrastructure, Sustainable Cities and Communities, and Responsible Consumption and Production. LIGHTCOPanel is a more sustainable alternative to traditional sandwich panels and reduces greenhouse gas emissions, lowers energy consumption, and minimises waste. LIGHTCOPanel is providing a more sustainable and cost-effective solution for buildings. RISE's innovative approach to sustainable development have led to the creation of a highly efficient and durable construction material.

RI.
SE

RISE, a leading Swedish research institute, with 3,100 + experts specialise in materials science, sustainability, and industry collaboration for innovative solutions.

www.ri.se

Solarface®
Solar Photovoltaic integration through the use of lightweight transparent composite materials

Conventional technologies for energy generation such as photovoltaics cannot provide a solution to all the challenges required for the integration in buildings, urban infrastructures vehicles and others. For these uses, in addition to energy generation, PV elements have to meet the requirements of the application itself: mechanical, aesthetic and others. Solarface® technology offers a viable and reliable solution to meet the challenge of PV integration.

Innovation: This innovation developed by EARTO member TECNALIA is a new PV module technology (concept, materials and manufacturing processes) for the manufacturing of PV products. It is based on the use of transparent glass fibre reinforced materials as encapsulant for the PV cells. The main features are high flexibility in design, lightweight and multifunctionality. It has been tested in a range of applications through years and it has shown to be technically and economically feasible. Based on this technology, a new startup company, Izpitek Solar S.L., has been set up for the manufacturing and commercialization of PV products.

Impact Delivered: A turnover for Izpitek Solar is estimated at around €5M in 2025 with the creation of at least 20 direct industrial jobs. It is likely that other industrial companies based on Solarface® technology may be created in future. The Solarface® project is aligned with the UN SDGs by addressing the improvement of health and well-being (G3), the development of sustainable cities and communities (G11).

tecnalia

TECNALIA is a Spanish RTO aiming to transform technology into GDP, helping companies to be more competitive and generate wealth and employment.

www.tecnalia.com

Towards buildings with energy label A++++

Imagine needing only sunlight to heat your home, while from the exterior your house is just as beautiful as your neighbours with a traditional façade.

Innovation: The H2020 ENVISION project coordinated by EARTO member TNO resulted in an innovative solution named Calosol, that uses exterior walls to extract heat from solar radiation. The solution consists of thermal façade panels that can be produced in any shape and colour. This is possible thanks to the special coating that was developed together with AkzoNobel and that harvests near infrared light from the sun. We have succeeded in integrating the panels in the energy system of a building, they act as a source for the heat pump. The panels ensure a 30% less energy usage compared to air heat pumps and have a return on investment of under 8 years.

Impact Delivered: Late 2021, Calosol was set up as a joint venture to market and upscale the innovative exterior-wall product. It is a game changing innovation that enables a big step towards an energy-neutral (or even energy positive) built environment. Houses can be heated completely gas free, without compromising on aesthetics. Moreover, the energy is harvested where it is consumed.

TNO innovation for life

TNO, The Netherlands Organisation for Applied Scientific Research, is a Research and Technology Organisation (RTO) that executes and transfers scientific research towards industry and government.

www.tno.nl

An evolutionary knowledge graph on local, national and international news

In the FFG-funded research project NEEED ("News-Extracted Evolving European Datasphere"), researchers and developers from Newsadoo GmbH, RISC Software GmbH and SCCH GmbH worked together on the further development of the "Newsadoo" platform. Designed as a "Spotify for News", Newsadoo allows digital news to be consumed and personalised recommendations on interesting topics to be used seamlessly on multiple devices.

Innovation: Each day, over 50,000 news articles from local, national and international news sources are processed automatically. With NEEED it is now possible to further structure and use the collected data in the form of a knowledge graph (datasphere), a dynamic network of related tags (keywords and key phrases) and their temporal development. This allows both long-term correlations (e. g. "Rome" and "Vatican") and short-term trends (e. g., "Queen Elizabeth" and "funeral") to be derived and analysed from local, national and international news articles.

Impact Delivered: With this technology, Newsadoo can reach a market-leading position in embedded news and related applications. Furthermore, Newsadoo creates custom-tailored news experiences by organising new content based on historical data.

UAR INNOVATION NETWORK · RISC Software GmbH · scch software competence center hagenberg · newsadoo

Upper Austrian Research GmbH is the leading organisation for non-university research in Upper Austria.

www.uar.at - www.risc-software.at - www.scch.at - www.newsadoo.com

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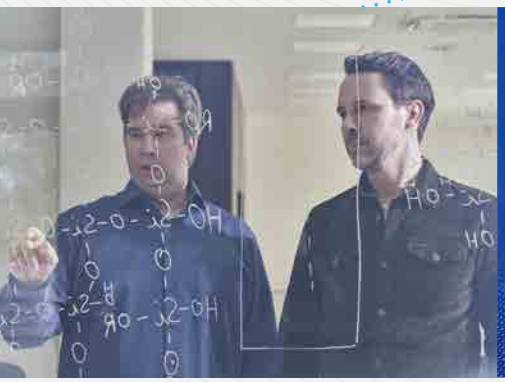
FRAUNHOFER

The Fraunhofer-Gesellschaft is a German RTO, which has a clearly defined mission of application-oriented research, with a focus on key technologies of relevance to the future.

The Fraunhofer UMSICHT is one of the 76 institutes/research units of Fraunhofer, the world's leading RTO for applied research, experimental development and technology transfer.



AEROPlaster: Revolutionary manufacturing process for superinsulating aerogels

Aerogels are considered the best insulation materials in the world, the application potential in building insulation is immense. Until now, aerogels are not available in sufficient quantities at a competitive price due to the expensive manufacturing process.

INNOVATION

EARTO member Fraunhofer-Gesellschaft – Institute for Environmental, Safety and Energy Technology (UMSICHT) have revolutionised the elaborate production process that has remained unchanged for 90 years. The process time is reduced by the factor of three, the usage of critical chemicals is eliminated. The developed process can easily be scaled up making aerogels available for the mass market.

IMPACT EXPECTED

Paying off on the SDGs 12 and 13, silicate aerogels are a sustainable alternative to established insulation systems and therefore ensure sustainable consumption and production patterns to, ultimately, combat climate change and its impacts. The application of aerogels in insulating plaster enables highly efficient thermal refurbishment, especially of existing buildings, combatting energy poverty.

Fraunhofer
www.fraunhofer.de

Fraunhofer UMSICHT
www.umsicht.fraunhofer.de

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VTT

VTT Technical Research Centre of Finland is a visionary research, development, and innovation partner. It is one of Europe's leading research institutions. Through scientific and technological means, we turn large global challenges into sustainable growth for businesses and society.

The Human Thermal Model (HTM), a non-invasive human thermal status monitoring in real time, all the time

Thermal satisfaction is one of humans' basic needs. Hence, thermal imbalance can trigger severe consequences such as heat exhaustion, heat strokes – or even fatality.

INNOVATION

EARTO member VTT developed the Human Thermal Model (HTM), an innovative deep-tech software algorithm that performs calculations and estimations of the physiological parameters of an individual (e.g., body temperature, blood oxygen consumption etc.). HTM Solutions Oy (a spin-off from VTT), developed an application named Cee° to use HTM algorithm, on mobile phones and other devices, or even on existing health apps. Cee° calculates parameters individually based on a person's body composition and gives alarms if the safety limits are triggered. Besides, it offers group monitoring, and thermal patient monitoring either at home or in hospitals.

IMPACT EXPECTED

HTM has the potential to make a major economic impact because by providing real time data on thermal comfort and heat stress, workers can take preventive actions to stay safe and comfortable in their work environment. These actions can result in a 5% increase in workers' productivity, which could translate into substantial cost savings for companies and industries, up to $12B. Besides, the expected social relevance and impact of this innovation is the thousands of human lives that can be saved.

VTT
www.vttresearch.com

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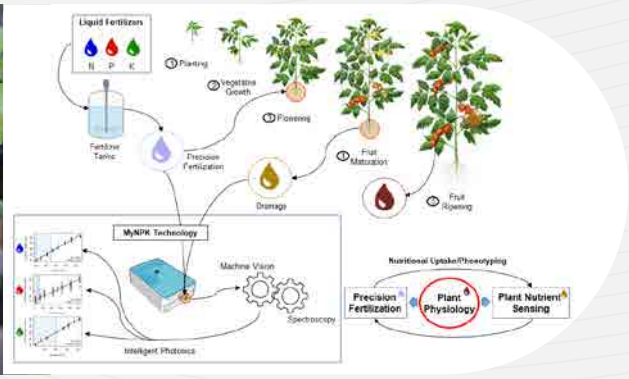


INESC TEC

INESC TEC – Institute for Systems and Computer Engineering, Technology and Science is a major Portuguese RTO dedicated to R&D and tech transfer of digital innovations.

MyNPK – Precision fertilisation sensing technology

Precision fertilisation is a process that involves using advanced technologies and data analytics to apply the right amount of nutrients at the right time to a crop, based on its specific needs. This approach aims to improve crop yield, reduce fertiliser waste, and minimise environmental impact.

INNOVATION

EARTO member INESC TEC developed MyNPK, which is an intelligent photonics technology that can quantify NPK in liquid fertilisers in situ and in real-time using UV-Vis spectroscopy and proprietary artificial intelligence. With a TRL5 prototype applied to hydroponics/fert-irrigation comprising an optical probe, spectroscopy, and signal processing with self-learning artificial intelligence. MyNPK is a reagent-less system, using only spectral information for NPK quantification, whereas current methods can only perform NPK quantification in the laboratory for complex compositional samples.

IMPACT EXPECTED

The system uses chemical network inference to determine NPK speciation and optimise nutrient flux according to plant physiology and uptake, maximising productivity and fertiliser usage. The goal is to make food production efficient, resilient, and sustainable due to the reduced impact on the environment and water quality.

INESCTEC
www.inesctec.pt

Substitution of Critical Raw Materials on aluminium alloys for the automotive Industry

Aluminium high performance nearly net-shape parts produced by High Pressure Die Casting process at Eurecat foundry pilot plant to assist low Critical Raw Material Aluminium alloy development and asses their performance."

While aluminium recycling is spread in the industry, recycled alloys are currently not able to fulfil structural applications due to limitations in their formability and mechanical performance. The innovation responds to the challenge posed by the European Green Deal for the automotive industry to migrate to solutions based in light structures, while at the same time avoiding dependence towards the importation of Critical Raw Materials (CRMs).

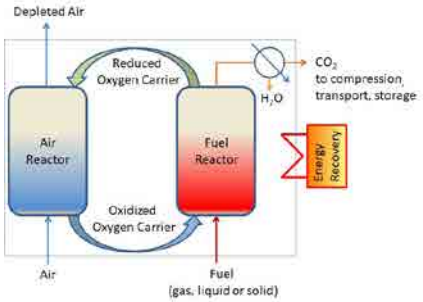
Innovation: EARTO member Eurecat has developed novel aluminium alloys with reduced usage of CRMs by harvesting the key elements, mainly the magnesium and silicon metal present in the aluminium scrap, and, on the other hand, finding and testing alteratives to these materials from the most commonly used aluminium alloys. The technology demonstrates the feasibility to substitute CRMs in alloying systems and present improved mechanical performance.

Impact Expected: The expected impact of the innovation decreases the dependencies on imported raw materials, while creating a sustainable economy for the future. In addition, improves the sustainability of the European automotive industry by reducing its environmental impact through the use of lightweight aluminium alloys and more efficient manufacturing processes.

Eurecat is the largest cross-sectoral and trans-national RTO in Catalonia, Spain, with 700 professionals covering all technological specialities to deliver added value to our society.

www.eurecat.org

Chemical Looping Combustion process for solid fuels



Chemical Looping Combustion of solid fuels with oxygen carrier particles involves reaction occurring in very severe conditions.

Innovation: EARTO member IFP Energies nouvelles (IFPEN) and TotalEnergies are developing a new process for the combustion of solid fuels enabling direct CO_2 capture to address the power plant / utility plant market. The net energy yield of the process is expected to be in the range of 40% with CO_2 capture efficiency above 90%. Compared to conventional CO_2 captures combined with solid fuel combustion processes, the CLC process reduces the energy penalty related to CCS by 50%, with a lower global CAPEX. Furthermore, applied to biomass combustion, the CLC process will contribute to create negative CO_2 emissions (Bioenergy with carbon capture and storage) similarly to DAC (Direct Air Capture).

Impact Expected: In the frame of the Cheers European project, with SINTEF, Dongfang Boiler Group and Tsinghua University, a 3 MWth Demonstration unit has been design and constructed and will enter operation phase in 2023. A first industrialisation is expected within 3-5 years and the CLC process could therefore play an important role to meet CCS expectation in the 2030-2050 timeframe.

IFPEN is a major research and training player in the fields of energy, transport and the environment.

www.ifpenergiesnouvelles.com

High performance bio-based resins with dynamic bonds for exceptional performance and circularity

Thermosets are a type of high-performance plastic found for example in airplane fuselages and electronic circuit boards that possess exceptional mechanical and thermal properties. However, they are traditionally made from harmful and toxic chemicals such as bisphenol A and cannot be re-used or recycled. They are traditionally incinerated or landfilled.

Innovation: EARTO member LIST has developed a new thermoset made from renewable resources. These thermosets are manufactured without the use of solvents or toxic catalysts, aligning with the principles of Green Chemistry. Notably, they possess internal catalysis for dynamic bonding, enabling remarkably rapid recycling and self-healing capabilities. Unique thermal and mechanical properties are guaranteed by the structure of benzoxazines.

Impact Expected: This innovation has a tremendous proven potential to reduce plastic and composite wastes and to lead to a significantly lower carbon footprint due to the renewable origin of most of the chemicals. This product is expected to reach the market within 3 years, and mainly targets Europe even if a worldwide impact can be expected.

The Luxembourg Institute of Science and Technology (LIST) is a mission-driven Research and Technology Organisation (RTO) active in the fields of materials, environment and IT.

www.list.lu

LeatherProBio: The second life of tannery waste

Leather production processes generate significant amounts of waste. It is assumed that 1 tonne of rawhides produces about 300 kg of leather, while the remaining 70% or so of the initial weight is waste. On average, tanneries worldwide generate approx. 800 mln waste tonnes/year.

Innovation: What makes the developed chromium tannery waste valorisation technology innovative is that it allows the concentration of the organic matter for the purpose of biogas production as well as recovery Cr compounds. The verification of the technology under conditions similar to real operating conditions proved that the Cr recovered from waste can be successfully used in rawhide tanning processes. On the other hand, the efficiency of the biogas production process from organic matter is at a level comparable to the efficiency of fermentation of traditional biogas substrates.

Impact Expected: The implementation of the technology will primarily have a positive environmental impact as it will call a halt to hazardous disposal of chromium tannery waste, as a result of which carcinogenic forms of Cr(VI) may be released into the environment. This means that the developed technology can help turn chromium tannery waste that causes environmental nuisance into an energy source and, at the same time, limit the use of Cr, which in the EU is a critical raw material.

The Łukasiewicz Research Network is one of the biggest research networks in Europe, with 7,00 staff and 22 research institutes in 12 cities across Poland.

lukasiewicz.gov.pl - www.leatherprobio.eu

T-sense inks

Measuring the temperature of solid objects is one of the challenges also in daily life. Some goods must be stored below a certain temperature to protect them from spoilage, while others must be properly heated to develop the desired quality. Existing temperature control options are limited and/or unsustainable.

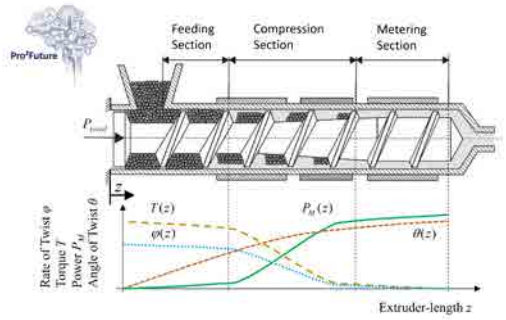
Innovation: MyCol, the spin-out company from EARTO member NIC, is developing inks that permanently change colour when heated above the colouration temperature Tc, which can be between -70 and 200°C. The inks are used to print indicator labels applicable to any reasonably smooth surface, but direct printing is also possible. The new critical temperature indicator has a negligible environmental impact and is recyclable like conventional packaging inks. The colour change is visible to the eye and can be included in automatic control with a video camera. "Colouring invisible changes" is the slogan of MyCol.

Impact Expected: This innovation can improve the cold chain by indicating when goods are overheated, providing evidence of storage at the correct temperature. High Tc inks can verify heating of any product and certify quality. Identifying the heating of valuable equipment can help prevent malfunctions and the consequences of damage.

The National Institute of Chemistry (NIC) works at the frontiers of chemistry, materials science, life science, engineering and environmental protection, targeting new technologies and products.

www.ki.si

Novel metrology allows deep insights into polymer extrusion process



Global annual plastic production reached approximately 370 million tons for 2020* - more than a third of which is processed by using extrusion machines. Depending on the processing, between 37% and 48% of the energy demand is provided by the extruder. Approximately 80% of this energy is introduced in the form of mechanical energy due to the rotating screw. By optimising the screw design, the whole energy consumption can be optimised.

Innovation: Researchers at Pro2Future, EARTO member through UAR, have succeeded in developing a novel measurement approach to identify how much mechanical energy is introduced at which axial extruder position. The measuring principle is based on the deformation of the extruder cylinder due to the energy input, which is detected by laser beam deflection using a mirror system. The physical principle is based on the mechanical power being proportional to the screw respectively cylinder torque.

Impact Expected: the measurement method can be used for process monitoring, design improvement (characterisation of the energy input along the processing unit), and optimisation and validation of simulation models, which means that more energy-efficient extrusion screws can be produced. This leads to a more sustainable screw design and overall, to an improved energy efficiency in polymer processing by approximately 8%.

Upper Austrian Research GmbH is the leading organisation for non-university research in Upper Austria.

www.uar.at - www.pro2future.at

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A*STAR

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector R&D agency and plays a key role in nurturing scientific talent and leaders for the biomedical and physical sciences as well as engineering ecosystem.

Cancer's new magic bullet? Developing safer and more targeted therapies for cancer patients

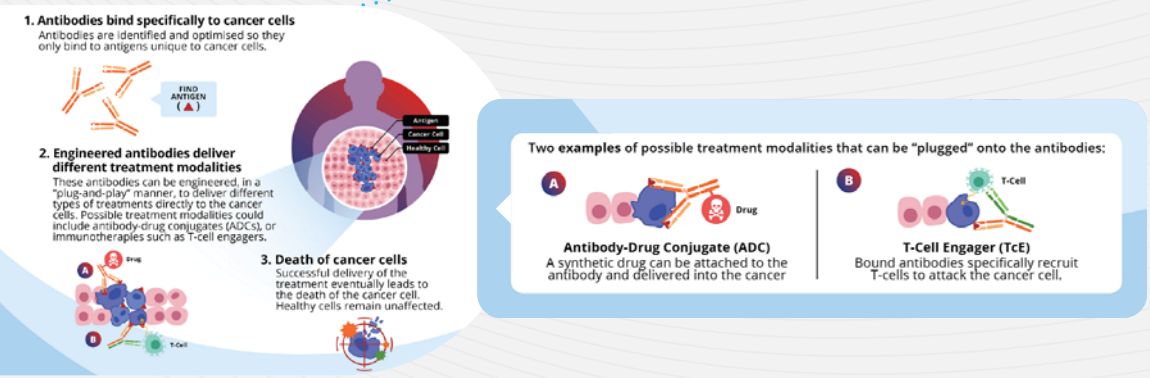
Cancer is the leading cause of death in Singapore, accounting for 28% of all deaths annually from 2018-2020. The Agency for Science, Technology and Research (A*STAR) is fighting cancer by developing safer and more targeted therapies for cancer patients.

INNOVATION

Researchers from A*STAR's Genome Institute of Singapore (GIS) and the Experimental Drug Development Centre (EDDC) have identified unique antigens found only on cancer cells using in-house developed novel antibodies. These antibodies allow for different ways to target only cancer cells in treatment. Such ways include directly signalling the body's immune system to attack only the cancer cells, or by conjugating the antibodies to a cell-killing drug for exclusive delivery to cancer cells. Using these antibodies from A*STAR, Boehringer Ingelheim aims to direct therapeutic effector mechanisms such as antibody-drug conjugates (ADCs) and T-cell engagers (TcEs) exclusively to tumour cells, and develop a range of highly targeted cancer treatments that target only tumour cells without binding to healthy cells.

IMPACT EXPECTED

The collaboration between A*STAR, EDDC and Boehringer Ingelheim to research, develop and commercialise the innovative antibodies will pioneer innovative targeted cancer therapies, based on the two versatile therapeutic platforms (ADCs and TcEs) that Boehringer Ingelheim are interested in. These new therapies can provide safer and more efficacious treatment for cancers with high unmet needs.



www.a-star.edu.sg

AIST / VENENO

National Institute of Advanced Industrial Science and Technology (AIST) established AIST Solution (AISol) in April 2023, which implements AIST`s technologies into society through companies. Veneno Technologies is the first AISol startup.

Innovative peptide screening technology to target membrane proteins

Receptors on cell membranes, such as ion channels and GPCRs, which are involved in various diseases, are important targets for drug discovery and have been the subject of research and development using small molecular compounds. However, there is a limit to how small molecules can regulate large receptors, and many drug development efforts have failed due to side effects caused by off-target effects.

INNOVATION

DRPs (disulfide-rich peptides) are natural bioactive peptides with high activity and selectivity for ion channels and GPCRs, and stability against heat, acids, and enzymes due to the plural SS bonds in the molecule. Focusing on such an ideal therapeutic modality, Veneno has developed the world's first high-throughput screening technology that induces artificial molecular evolution by high-speed intracellular selection of variants from more than one billion custom-made DRP library.

IMPACT DELIVERED

Veneno's drug discovery platform technology by using huge library differs significantly from traditional natural product drug discovery, it is possible to comprehensively create optimal new DRPs. In addition, Veneno can generate huge libraries on-demand using DRPs with various known properties as templates, and screen optimal DRPs for various cell membrane receptors in a short period of time. Using our technology, it is possible to convert an undruggable target into a druggable one.

Video: The Periss method

AIST
www.aist.go.jp

VENENO TECHNOLOGIES
www.veneno.jp

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ELDORADO

Reference in Research, Development and Innovation in Brazil, ELDORADO RTO has 24 years of experience in creating innovative technologies and solutions for companies and society.

Intelligent mobile devices making decisions to enhance people's lives

Mobile phones provide access to many data-intensive technologies and services, through business apps, video calls, gaming and internet social services. However, this rich data is not leveraged to provide a distinguishing UX. Through this open innovation project, we propose to create intelligent agents, using cognitive architectures, which will analyse users' interactions with the devices to promote personalised content for them.

INNOVATION

This project is being developed by the modern Hub of Artificial Intelligence and Cognitive Architectures in cooperation with UNICAMP, ELDORADO and the mobile phone industry (supported by PPI-Softex/MCTI), and proposes a scientific and applied research in cognitive AI. The goal is to create intelligent agents to be embedded on a mobile device to assess user behavior and to make decisions to provide personalised recommendations.

IMPACT EXPECTED

This project result, to be available to the industry, will help people to make better use of mobile device capabilities. It will enable smart devices to make decisions for users in real-time. In-device intelligence may also provide aggregate information to allow governments to eventually prioritise social investments in public services. We acknowledge the support of PPI-Softex/MCTI by grant 01245.013778/2020-21 through the Brazilian Federal Government.

H.IAAC | HUB DE INTELIGÊNCIA ARTIFICIAL E ARQUITETURAS COGNITIVAS

ELDORADO

www.eldorado.org.br

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ITRI

ITRI is a world-leading applied technology research institute with more than 6,000 outstanding employees. Its mission is to drive industrial development, create economic value, and enhance social well-being through technology R&D.

Renewable PV module technology for a circular economy

To completely recycle PV modules upon decommissioning, ITRI has developed the Renewable PV Module Technology (RePV), a solar module innovation that is "Circular by Design", featuring high efficiency, good durability, easy-to-disassemble structure, and can fully recovery materials to retain economic, environmental, and social value. This is the first PV module that can be fully dismantled with glass panels and solar cells intact. RePV meets IEC 61215 and IEC 61730 standards and has been certified by TÜV Rheinland for its high safety and reliability.

INNOVATION

ITRI designed a new PV module structure by controlling the density of chemical bonds between the molecules network of encapsulation material. This network acts as the gas channel for the decomposing encapsulation material during pyrosis recycling. This innovative PV structure allows for full dismantlement without cracking the glass panels and solar cells. The reclaimed materials are available for reuse in a new PV module, making it a cradle-to-cradle innovation.

IMPACT EXPECTED

RePV lengthens product lifecycles, closes the loop on solar panel recycling, and minimises manpower costs. With this technology, RePV is estimated to reduce carbon emissions by 50% or more, opening the door to a sustainable circular economy. The recycling value of RePV is estimated to be 70M $/GW, a three-fold increase over existing approaches. It turns obsolete PV modules from E-waste liability to assets worth nearly 113.5M $/GW.

Video: ITRI's Easy Dismantled Solar Panel Module

ITRI Industrial Technology Research Institute
www.itri.org

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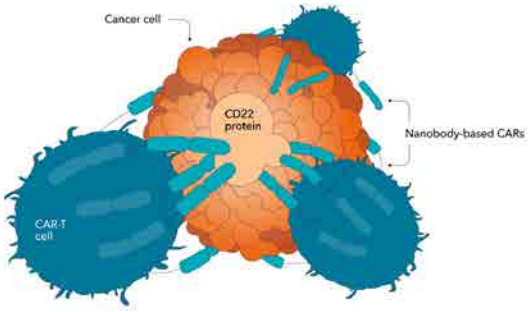
NATIONAL RESEARCH COUNCIL CANADA

As a federal research and development organisation and Canada's engine for industrial innovation, the NRC is focused on translating research and technology into prosperity.

Nanobodies hold key to new CAR-T

National Research Council of Canada (NRC) discovery opens the door for new cancer immunotherapy treatment

In CAR-T therapy, white blood (T) cells are engineered to detect and kill cancer cells, while saving healthy cells. This is done by modifying the cells to express a chimeric antigen receptor (CAR) with an antibody domain that recognises and binds to a specific protein on cancer cells. CAR-T therapies have helped many leukemia and lymphoma patients worldwide by targeting the CD19 protein, but many patients relapse when CD19 disappears from the cancer cells.



INNOVATION

The National Research Council Canada (NRC) identified and characterised unique camelid nanobodies that detect the CD22 protein on leukemia and lymphoma cells. Using these nanobodies, the NRC designed a CAR with exceptional ability to engage T cells to kill B-cell cancer cells. The NRC's CAR enabled the collaborative Canadian-Led Immunotherapies in Cancer program to develop the world's first clinical grade CD22 CAR-T therapy using nanobodies, which is expected to go through clinical trials in 2024.

IMPACT EXPECTED

This exciting, publicly-funded nanobody-based therapy offers a new way to treat blood cancer, with reduced risk of remission. Based on this model, the NRC is leveraging the size and modularity of nanobodies to improve efficacy by developing CARs that target multiple proteins (CD22 and CD20) on B-cell cancer cells. A groundbreaking approach to CAR-T therapy, this innovation has life-saving potential for many hard-to-treat diseases such as brain, pancreatic and lung cancer.

Canada
National Research Council Canada
Conseil national de recherches Canada

www.nrc.canada.ca

NST / ETRI

The National Research Council of Science and Technology (NST) supports and fosters 25 government-funded research institutes of Korea in the field of science and technology.

The world's first simultaneous transfer and bonding technologies for micro LED displays

The Electronics and Telecommunications Research Institute (ETRI) developed the world's first next-generation display technology that can simplify the process and reduce incidental expenses considerably. At the same time, new materials required for the new process were also developed for the first time in the world and is expected to support the Korean industry maintaining its leading position in the next-generation display market.

INNOVATION

All existing methods were based on the sequential processes: the "transfer" and then "bonding" but ETRI combined them into one single process by using SITRAB (Simultaneous Trasfer and Bonding) adhesives – novel materials also developed by ETRI. The key point of this process involves placing SITRAB adhesive between the interposer, composed of red, green, and blue micro LEDs, and the display panel and by irradiating the homogenised laser onto it, the bonding and transfer process occur simultaneously within a few seconds. In addition, the newly developed materials can attach additional micro LEDs even if they are hit by laser multiple times, making them more convenient to repair defective pixels.

IMPACT EXPECTED

With this technology, equipment investment costs are expected to decrease by 1/10, while productivity is anticipated to increase by more than 10-fold. Material expenses and costs for repairing defective pixels are also expected to reduce to less than 1/100. It is expected to commercialise within two years through technology transfer to domestic display companies.

nst National Research Council of Science & Technology
www.nst.re.kr

ETRI Electronics and Telecommunications Research Institute
www.etri.re.kr

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