THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

iTDO
Innovation and Technology
Development Office
創新及科技發展處

2020

Jockey Club Innovation Tower

Addressing Your
Unmet Needs Through
INNOVATION

RESEARCH COLLABORATION HIGHLIGHTS

INTERNATIONAL

The World's Most Comprehensive Rapid, Automated Multiplex Diagnostic System

Supported by Avalon Biomedical and the University of Hong Kong, this new diagnostic system can identify 30 to 40 pathogens, including SARS-CoV, MERS-CoV and 2019-nCoV, in one single test within approximately one hour.

INTERNATIONAL

Partnering with Top-Notch Research Institutes on Marine Robotics

PolyU joins forces with Imperial College London, UK and Shenyang Institute of Automation to innovate ground-breaking applications of robotic systems to explore oceans in a new way.

INTERNATIONAL/CHINA

Advancing Industry Food Safety Standard

PolyU Food Safety Consortium and Bright Food International established a joint research laboratory to facilitate technology transfer for practical applications to support the advancement of food safety and quality to benefit a wider community.

GREATER BAY AREA

Collaborating with Top Textile University in Southern China to Promote Green and Healthy Textiles

This collaboration with Wuyi University aims to promote green, healthy and intelligent textiles, including dyeing and finishing technologies for fabrics to address the health and environmental concerns associated with man-made fibers and their chemical processes; furthermore, ingredients and methodologies to enhance the anti-bacterial, anti-microbial and anti-fungal performances in textiles will be studied.

CHINA

Fostering Research Collaboration Across Multiple Disciplines

Jiangsu Industrial Technology Research Institute shall collaborate with PolyU on research projects in a range of fields, including biomedical science & engineering, pharmaceutics & medicines, environmental science & engineering, new generation information & communication technology, and high-end manufacturing and equipment.

CHINA/GREATER BAY AREA

The Greater Bay Area Industrial Big Data Lab

PolyU shall work with CASICloud and Altai Technologies to spearhead research on industrial big data, artificial intelligence, industrial internet-of-things and industrial safety, as well as develop research talents in the Greater Bay Area.

R&D CENTRES

Centre for Eye and Vision Research (CEVR)

In partnership with University of Waterloo, the Centre shall foster a closer partnership in education, research and entrepreneurship in eye and vision. The research will include Waterloo Nobel Prize-winner Professor Donna Strickland to expand the award-winning work on chirped pulse amplification (CPA) to develop a laser-based two-photon excitation technique for photodynamic drug therapy to remove abnormal blood vessels in the retina with a high degree of accuracy.

Centre for Advances in Reliability and Safety (CAiRS)

In partnership with the University of Maryland, College Park, CAiRS aims to link up academic and industrial counterparts to introduce and implement new artificial intelligence methods and deep learning techniques with reliability modelling, with the goal of improving the products reliability and systems safety of critical components and devices, products, systems and sub-system designed, commissioned and/or manufactured by Hong Kong companies and enterprises.

Laboratory for Artificial Intelligence in Design (AiDLab)

In partnership with the Royal College of Art (RCA), this world's first and leading research facility aims to advance the integration of Artificial Intelligence into the design of products and service. The lab will address industry demands for efficiency, automation and customising products and services in the innovation and technology era.

RESEARCH INSTITUTES

Research Institute for Smart Energy

The research institute aspires to be a leading institute that advances and transfers knowledge on smart and sustainable energy, for the benefit of Hong Kong, the nation and the world. It will focus on five key research areas, namely, smart solar energy conversion, smart/green conversion of fossil fuels, advanced materials for batteries, smart energy storage, and smart utilization of energy.

Research Institute for Sustainable Urban Development

With the massive urbanization process in China where cities are developing according to Hong Kong's high-density urban development model, the research institute was established to develop innovative solutions for sustainable high-density cities by capitalizing on the living laboratory of Hong Kong's urban environment and the multi-disciplinary expertise of PolyU.

Smart Cities Research Institute

Aspiring to be a centre of excellence in urban informatics worldwide and a living laboratory of Smart City development for Hong Kong and the Greater Bay Area, the institute provides a platform for PolyU's experts to develop an international leading area in Smart Cities by capitalizing on existing interdisciplinary research strengths and it will devote more research effort into the area of Smart Mobility focusing on the unique traffic characteristics of Hong Kong.

STRATEGIC AREAS

LIFE SCIENCE AND HEALTHCARE

### 1. A New Class of Antibiotic Candidates for Fighting Against Superbugs

This new class of antibiotic candidates has great potential to be developed into a new generation of antibiotics fighting against multi-drug resistant superbugs, including methicillin-resistant Staphylococcus Aureus.

2. Continuous Artificial Synthesis of Glucose Precursor Using Enzyme-Immobilised Microfluidic Reactors

Food production relies heavily on natural photosynthesis of green crops, but its energy efficiency is low due to low activity of the enzyme RuBisCO. This innovation can replicate natural photosynthesis using an integrated microfluidic system with more controllability and much-improved energy efficiency.

3. Platform for Algal-based Biofuel Comprises a System for the Removal of Microalgae Biomass from Water

A platform is being developed for producing algal-based biofuel that comprises a system for removal of microalgae biomass from water.
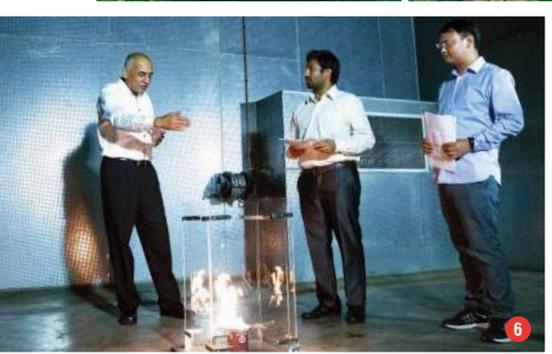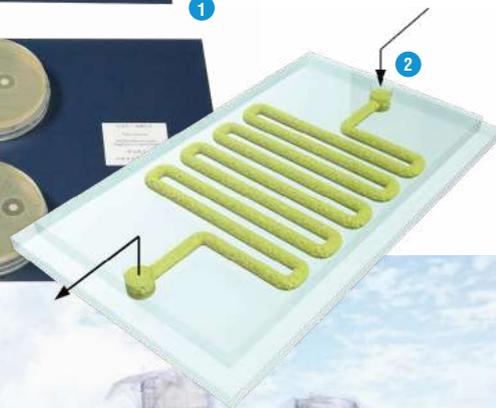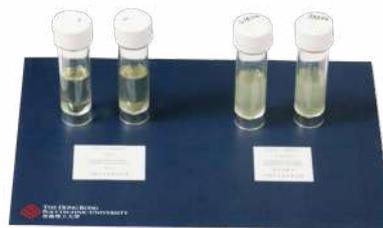
AI, MACHINE LEARNING AND SMART LIVING

4. Mapping Landslide Hazards Using Deep Learning and Remote Sensing

This innovative uses deep learning and remote sensing techniques to map hillside rock outcrops. Its efficient and cost-effective system provides vital information on the surface geology of Hong Kong's natural terrain to mitigate landslide hazards.

5. Autonomous UAV Systems for E&M Inspections

Powered by artificial intelligence, this innovation can inspect electrical and mechanical installations such as road lamps, CCTV and lamp shades. It is also capable of operating real-time in dark, dusty, humid conditions and scanning the environment for tunnel inspections.

6. Smart Urban Resilience and Firefighting

The SureFire System adopts complex data generating networks that enable real-time monitoring of the evolution of urban environments and hazards. Proper analysis of this data based on artificial intelligence can deliver information that continuously determines the state and evolution of systems and diagnoses emergent pathologies and support decision making.

ADVANCED MANUFACTURING AND HIGH-SPEED RAIL

7. Health Monitoring for Maglev Train Systems

Parameter detection tests have been carried out to improve the reliability and safety of the Low-speed Maglev Train-Suspension-Guideway Coupling System with Tongji University; since early 2019, these field tests have been conducted to monitor the dynamic characteristics and comfort of the Changsha medium-low maglev train and Lingang maglev test line.

8. Aircraft Damage Inspection and Assessment

To identify and categorise damage to airframes, an innovative approach has been developed incorporating a camera system capable of detecting damage from 35 metres, a surface scanner and flash thermography system for damage assessment and a corrosion classification system.

9. Object Detection and Distance Measurement Sensor Based on Light Field Imaging

This novel imaging system can identify a micro object from its 2D digital photos and acquire its light field information in real time for distance measuring or 3D reconstruction. The system is useful for medical diagnosis related to live body tissues, or quality control in semi-conductor manufacturing.

SUSTAINABLE INFRASTRUCTURES

### 10. Sustainable Materials for Marine Infrastructure

A new type of concrete for marine infrastructure is being developed to address severe deterioration in marine infrastructure caused by steel corrosion by replacing it with fibre-reinforced polymer as the reinforcing material.

11. Atmospheric Acidic Ultrafine Particle (AUFPs) Measuring Device

This novel device, comprising of a diffusion sampler and a quartz crystal microbalance detector with specially treated crystal oscillators, can measure AUFPs concentration to monitor air pollution in a safe, accurate and reliable way.

12. Building Ultraconformal Protective Layers on Both Secondary and Primary Particles of Layered Lithium Transition Metal Oxide Cathodes

A technological breakthrough in layered lithium transition metal oxide cathodes offers a promising design strategy for Ni-rich cathodes towards high-energy, long-life and safe lithium-ion batteries.
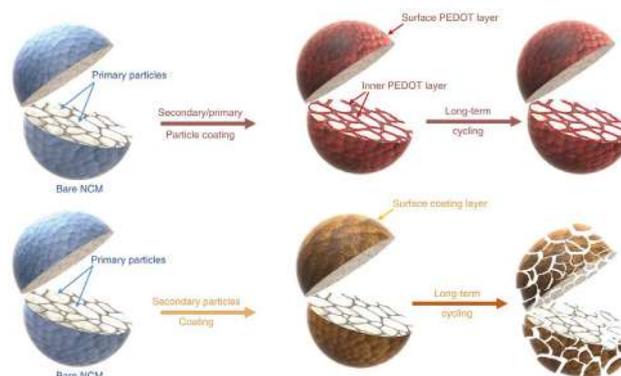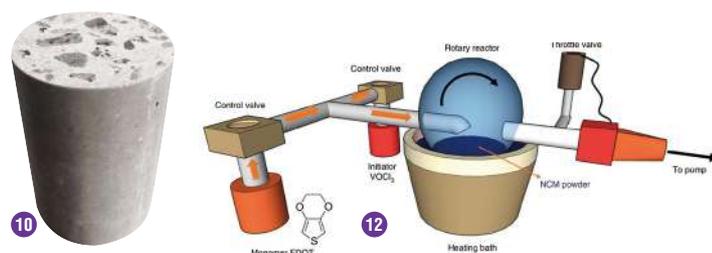
MEDICAL DIAGNOSTICS & THERAPY

WATER DISPERSIBLE AUTOFLUORESCENT POLYMER DOTS
COMPRISING OF NON-CONJUGATED POLYMERS

This new type of photoluminescent nanoparticles uses inexpensive nonconjugated polymers as building blocks, and has the ability to display ultra-bright and multi-color fluorescence upon excitations in both water and dry states. It has various potential applications, including serving as: bioimaging markers for in vitro cell imaging; autofluorescent nano-carriers for image-guided therapy; nanofillers in plastics for LED diffuser applications; fluorescent ink in anti-counterfeiting applications; chemosensors for heavy metal detection and structural health monitoring.
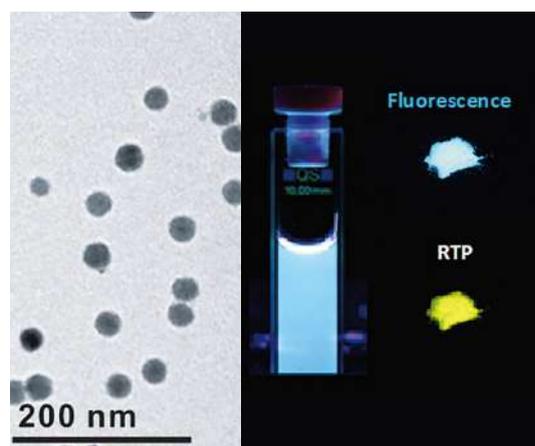
NOVEL FEATURES

* Ultra-bright photoluminescence with good photo-stability
* Excellent water dispersibility and low cytotoxicity
* Simple and versatile synthetic strategy adopted
* No aggregation-caused quenching effect
* All materials easily available at low cost

WIRELESS PORTABLE DEVICES FOR **DIABETES MANAGEMENT AND DISEASE DIAGNOSTICS** VIA SALIVA ANALYSIS

mobile reading   palm-sized meter

small volume saliva

OECT test strip

▲ This wireless sensing system consists of an organic electrochemical transistor test strip on a plastic substrate, a portable meter with mobile application support. It can directly show test results in a mobile phone and suggest further actions if needed. The portable device can provide point-of-care testing which can substantially increase test efficiency.

This innovation can realize quick and ultra-sensitive detections of glucose, uric acid or RNA biomarkers for disease diagnostics and virus detection. The most important application is for non-invasive glucose detection in small volume saliva samples, thereby providing a painless and convenient approach for diabetes management.

NOVEL FEATURES

* Provides non-invasive and quick detections of glucose levels in saliva
* Supports diagnosis of various diseases and fast detection of virus
* Adopts a low-cost solution-based printing technique
* Can be miniaturized to micro-meter size – allowing simultaneous detections of various biomarkers

ULTRASOUND IMAGING & FIBER OPTIC PRESSURE SENSING COMPOSITE CATHETER FOR **CARDIOVASCULAR DISEASE DIAGNOSTICS**

Integrating Intravascular Ultrasound Imaging (IVUS) diagnosis and Fiber Bragg Grating (FBG) optical pressure sensing techniques, this innovation provides a complementary cardiovascular diagnostic technology with simultaneous ultrasound imaging and Fractional-Flow-Reserve (FFR) functions. This integrated system can simultaneously "see" the narrow site of the cardiac blood vessel and give the FFR value across this narrow site, supporting doctors with the most accurate information to judge whether a heart stent surgery is required. This is a brand-new diagnostic technology with strong potential to be implemented in cardiac disease diagnostics.

NOVEL FEATURES

∗ Faster and more accurate diagnostic process than separately using IVUS and FFR pressure sensing system

∗ The integrated system allows for lower manufacturing cost

▶ IVUS radial array transducer integrated with double FBG blood pressure sensors for FFR measurement

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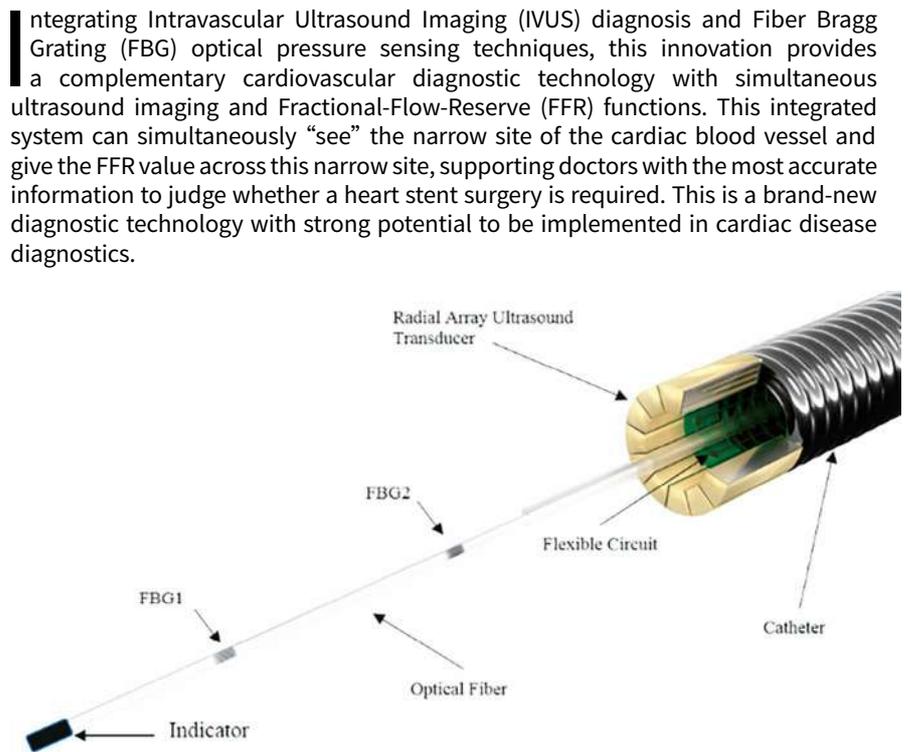
POLYUSTIMULATOR – ULTRASOUND DRIVEN PIEZOELECTRIC STIMULATOR FOR **NEUROMUSCULOSKELETAL REHABILITATION**

TechConnect
INNOVATION
AWARD
2020

As existing electroceutical stimulators are bulky with limited life span and poses transmission efficacy and safety concerns, wireless power delivery to electrical implants deep inside the body remains a critical challenge. The PolyUStimulator presents a battery-free, ultrasonically-powered, piezoelectric stimulator for functional muscles, nerves and bones. This innovation can treat patients, ranging from neurological to orthopedic conditions, whom are paralyzed or suffering from non-union bone fractures or neuromusculoskeletal pain.

▶ A. Design Components
   B. Prototype of the PolyUStimulator
   C. Implantation technique (patented) of the PolyUStimulator via a custom injection at the sub-dermal area
   D. Cross-section view of the injectable PolyUStimulator
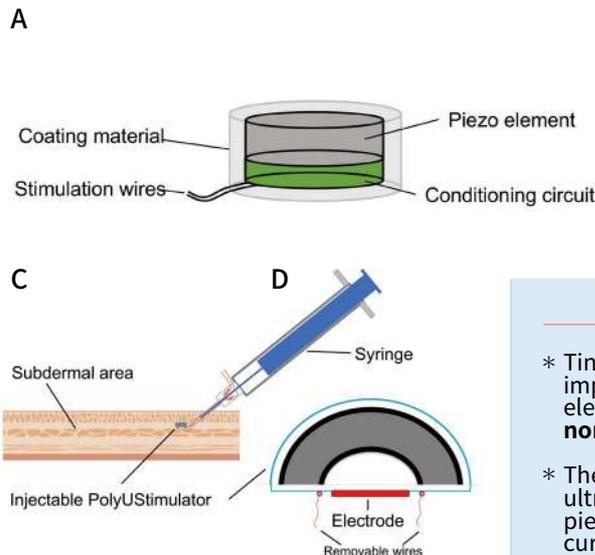
NOVEL FEATURES

∗ Tiny (injectable), wireless implant to provide electroceutical treatments, **non-surgical**

∗ The implant converts ultrasound energy into piezoelectric stimulation current, **battery-free**

∗ Ultrasounds can reach deep into the body where conventional inductive energy cannot reach safely, **anywhere**

∗ Ultrasound is also safe from RF and other interferences, **safe**

∗ Fully MRI and X-ray compatible, **ubiquitous**

BIOMIMICKING PHOTOCROSSLINKABLE
NANOCOMPOSITE BONE GRAFT

A novel photocrosslinkable nanocomposite bone graft is developed by mimicking the natural bone structure. With this technology, surgeons can premade, trim and directly apply the nanocomposites during bone graft operations according to patients' needs, thereby greatly reduce the bedridden time. This innovation can serve a huge number of patients receiving orthopedic surgeries, such as for craniomaxillofacial, dental, foot & ankle, as well as joint reconstruction, long bone and spinal fusion.

▶ Application of Photocrosslinkable Nanocomposite Bone Graft
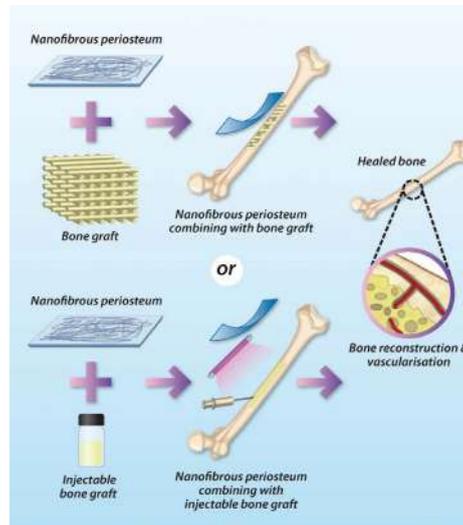
NOVEL FEATURES

* Provides optimal mechanical support for accelerated bone regeneration
* Possesses long-term bio-compatibility
* Low temperature and organic solvent-free fabrication process allows the long-term release bioactive molecules
* Simple and green fabrication processes - readily scaled up for mass production
* Low cost and easily stored in dry environments

MULTI-FUNCTIONAL GAS VESICLES FOR ENHANCED CANCER THERAPY

Recently reported gas vesicles (GVs) have been demonstrated as the first biomolecular acoustic reporters with gene editability and inherent stability. In this innovation, multi-functional GVs are developed for enhanced cancer therapy through surface modification, endowing it with various properties. Notably, the PEGylated HA-GVs have high tumor-targeting efficacy, enabling it to serve as a molecular ultrasound probe for in vivo tumor detection; whereas lipid-GVs could function as an oxygen carrier that could deliver large quantity of oxygen to the tumor site to alleviate tumor hypoxia. In general, GVs themselves could facilitate the occurrence of cavitation which can potentially enhance the efficacy of sonodynamic therapy. As such, modified GVs could function as a potent theranostic tool in the future of cancer treatment.

NOVEL FEATURES

* High tumor-targeting efficacy
* Alleviates tumor hypoxia
* Enhances the efficacy of sonodynamic therapy
* Safer and cheaper than previous man-made nanoparticles

▶ In vivo ultrasound images of tumor after intravenous injection of GVs, HA-GVs and PH-GVs

ADVANCED MANUFACTURING & INSTRUMENTATION

PRECISION PHOTO-REDUCTION TECHNOLOGY FOR FAST AND DIRECT PRINTING OF MICRO-PATTERNED PLASMONIC STRUCTURES
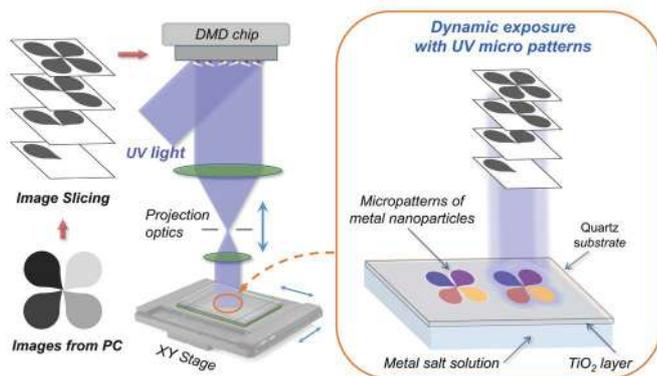
This novel precision photo-reduction technology for plasmonic substrates and micro-device development is developed for fast, direct and cost-effective printing of micrometer-scale patterns with size-controlled silver/gold nanoparticles. This technology stems from a combination of digital ultraviolet (UV) lithography technology and light-controlled photo-reduction method and can rapidly and precisely control the growth of metal nanoparticles on a photocatalytic layer.

NOVEL FEATURES

* Fast, direct and cost-effective printing of micrometer-scale patterns with size-controlled metal nanoparticles
* Allows the one-step manufacturing of multi-scale engineered plasmonic substrate without nanostructured templates nor additional nanofabrication processes
* No waste of metal through a micro-fabrication approach

◀ Schematics of the precision photoreduction technology for printing of micropatterns of metal nanoparticles.

NOVEL MAGNETIC FIELD-ASSISTED MASS POLISHING OF ULTRA-PRECISION FREEFORM SURFACES
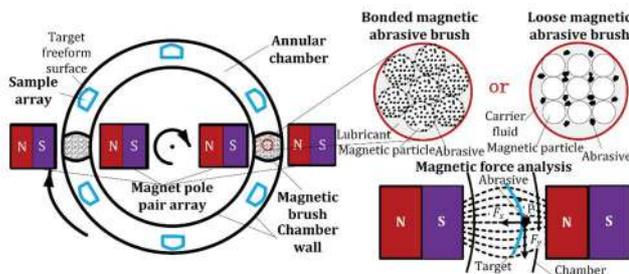
▲ MAMP Schematic Diagram and Experimental Setup

Freeform surfaces have been widely used in various high-value-added applications, such as superfinishing surgical tools and optical molds. However, current mass finishing technology is inadequate to achieve nanometric surface roughness of freeform surfaces for their functional applications. This Magnetic Field-Assisted Mass Polishing (MAMP) technology is developed to provide a novel solution for achieving nanometric fast-finishing of a number of freeform components simultaneously. MAMP makes use of a rotational magnetic field applied outside an annular chamber which drives the magnetic abrasives to impinge on and remove material from the workpiece mounted inside the chamber. MAMP has been proven to have high accuracy, high efficiency and cost-effectiveness with successful applications in mass super-finishing of surgical tools and optical molds.

NOVEL FEATURES

* Achieves nanometric fast-finishing with high accuracy, high efficiency and cost-effectiveness
* Can be scaled to different sizes for various applications

MEASURING THERMAL CONDUCTIVITY FOR SUBMILLIMETER-SIZE MATERIALS

This new experimental method is developed to measure the thermal conductivity of the unknown biomaterials with limited size.

NOVEL FEATURES

* Sample preparation is simple without need for special treatment
* Requires less facilities with low cost
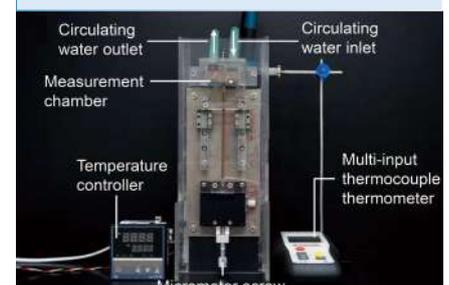
▲ Photo of an apparatus for measuring the thermal conductivity

ADVANCED TEXTILE TECHNOLOGY

POSTURE TRAINING BODYWEAR FOR OLDER ADULTS WITH DEGENERATIVE SCOLIOSIS

To address the needs of patients suffering from Adult Degenerative Scoliosis, this innovative posture training bodywear is designed and developed based on clinical applications, materials science, garment design and wearable technologies. This innovation can also be in orthotic products and will add a new dimension to medical clothing for patients.
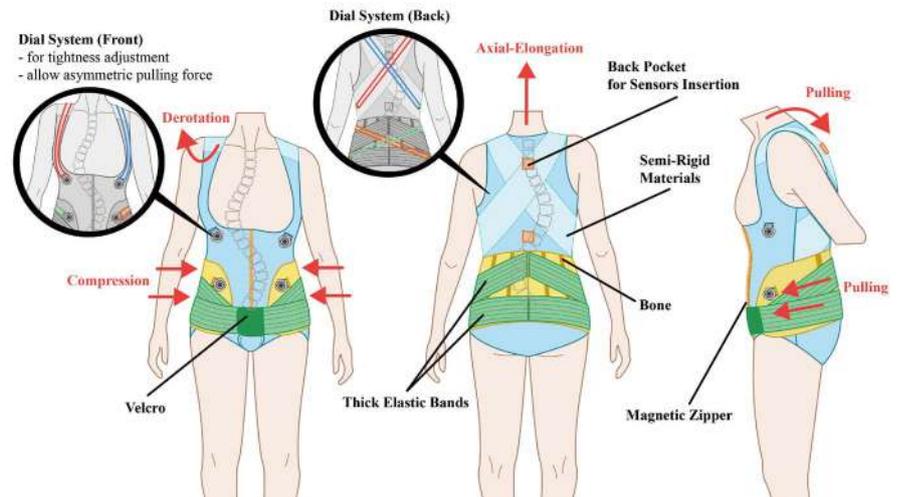

▲ Front, back and side views of posture training bodywear

NOVEL FEATURES

* Maintains the level of bodily function and minimizes symptom progression
* Supports body alignment and pain management
* Addresses the abilities of older patients by adopting a specially-engineered pulley system
* Enhanced effectiveness of brace treatment by combining the application of active corrective forces from a Vibro-Tactile Feedback system and passive corrective forces

CHITOSAN MEDICAL & HEALTH TEXTILE SOLUTION

Chitosan fiber possesses numerous advantages, such as biodegradability, nontoxicity, and unique antimicrobial properties and cell regeneration & wound accelerating effects. Unlike normal practice that apply chitosan to material surface, this technology enables unique textile structure to have the advantages of chitosan while preserving the highly flexible textile structures; it can be applied in daily & protective wear, interior & furniture, filtration, sanitary products and cosmetics, to name a few.
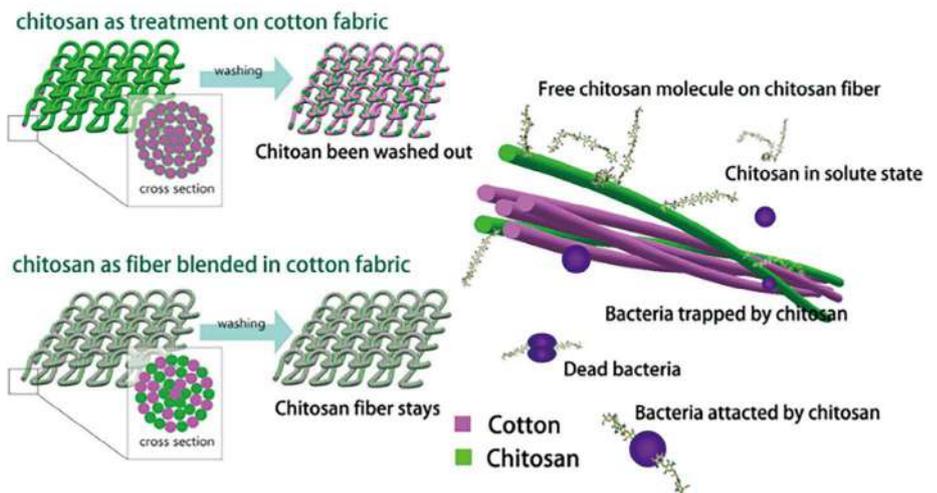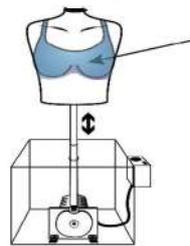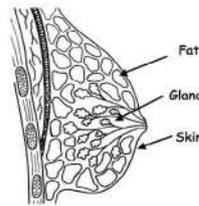

NOVEL FEATURES

* Possess bio-degradability, non-toxicity and unique antimicrobial properties with wound accelerating effects
* Durability and permeability significantly improved while preserving the advantages of fabric structures
* Can be mixed in other high-performance materials to give anti-micro-organism, anti-odor properties

A SOFT MANIKIN SYSTEM FOR EVALUATING DYNAMIC BREAST MOVEMENT AND PRESSURE SENSATION FOR BRA DESIGN OPTIMISATION

To date, the characterization of bra support and contact pressure mainly relies on human wearer trials where reproducible testing is difficult to achieve and experienced technicians are always required. Through a scientific analysis of the bio-mechanical interface between the human body and the bra, a novel soft manikin system is developed for the evaluation of bras – taking into account the level of breast support, displacement and wearing comfort during dynamic body movements and physical activities. Through this innovation, the most beneficial bra design features for different end-uses can be objectively identified.


Motion capturing camera

NOVEL FEATURES

* Scientific evaluation of breast tissue simulant and vertical breast displacements at various bra conditions by using a simple setup of motion capturing system
* Custom-designed bra pressure sensation evaluation system by using low-cost force sensors that are form-fitted on the soft skin surface for improved precision

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FINE, SOFT AND WASHABLE ELECTRONIC YARNS MADE BY SCALABLE MANUFACTURING PROCESSES

This innovative electronic yarns are the world's finest for electronic knitting or embroidery with a diameter of less than 1 mm. It is very soft with bending rigidity only a tenth of the existing products of the same diameter. The electronic yarn can be applied as part of textile fabrics and form many possible shapes, and has wide applications including medical devices, sports, automotive accessory, fashion, art performance, military and aerospace.
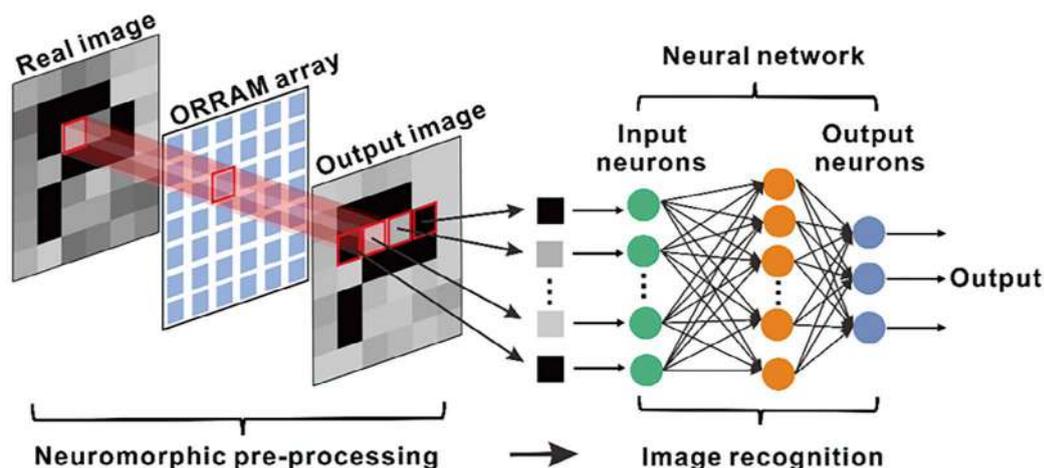
NOVEL FEATURES

* High softness, high breaking strength and small yarn diameter for convenient knitting
* Provides electric insulation and protection against dust and water for good washability
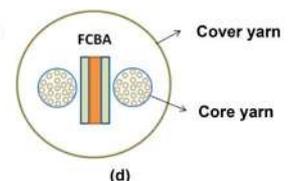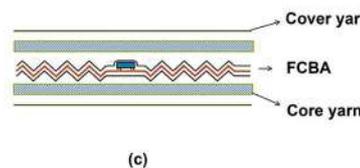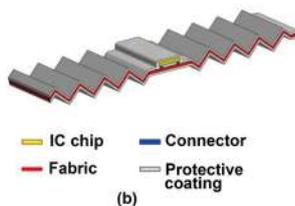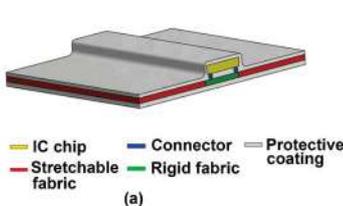
▲ (A) and (B) Two types of schematic FCBA (Fiber-based Circuit Board Architecture) structure; (C) Composite electronic yarn; (D) Cross-section of the composite yarn

AI, DATA, CYBER

NEUROMORPHIC VISION SENSOR FOR IMAGE PRE-PROCESSING

Conventional digital image sensor generates large redundant data and occupy huge storage space with high power consumption. By adopting an optoelectronic memory synaptic device, this novel neuromorphic vision sensor has the potential to help solve this problem through direct image pre-processing at the sensing devices. This technology incorporates directly image storage and pre-processing functions into image sensors, achieving a breakthrough in hardware-based artificial vision. In addition, it can be beneficial for the future development of edge computing and largely reduce the image processing load at the cloud.


▲ Schematic of an artificial visual system with ORRAM for neuromorphic pre-processing and artificial neural network for image recognition

NOVEL FEATURES

∗ Integrates visual information detection, storage and pre-processing functions
∗ Enhances the area efficiency and image processing efficiency
∗ Reduces the image processing load at the cloud
∗ Lowers electric loss during data transmission

DATA STORAGE USING PEPTIDE SEQUENCES
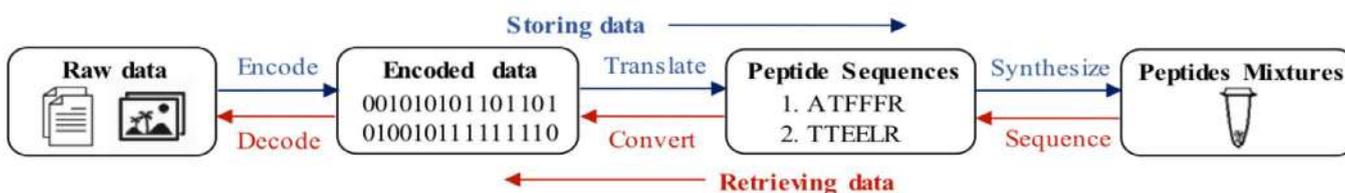
▲ The process of storing and retrieving data into and from peptides

In response to the huge amount of digital generated today, a novel method is developed by using peptide sequences to store data and retrieving it via tandem mass spectrometry. Compared with existing commercial data storage devices and other developing technologies such as DNA data storage, peptides offer a much higher storage density and longer storage duration. Combining proteomics and data storage technology, this innovation has the potential to transform the data storage industry, including to be deployed in space mission!

NOVEL FEATURES

∗ Allows for high data storage density with limited minimal space requirement
∗ Long durability for data storage - with peptide still being viable for sequencing even after millions of years

3D LIDAR-AIDED **GNSS PRECISE POSITIONING** FOR L4 AUTONOMOUS DRIVING

This 3D LiDAR-Aided GNSS Precise Positioning technology tightly couple the environmental perception capability with high-precision satellite positioning technology that is equipped with an intelligent self-adjusting satellite ranging measurement modeling and correction. This allows highly robust centimeter-level high-precision global positioning in urban environments to be achieved for L4 Autonomous Driving.
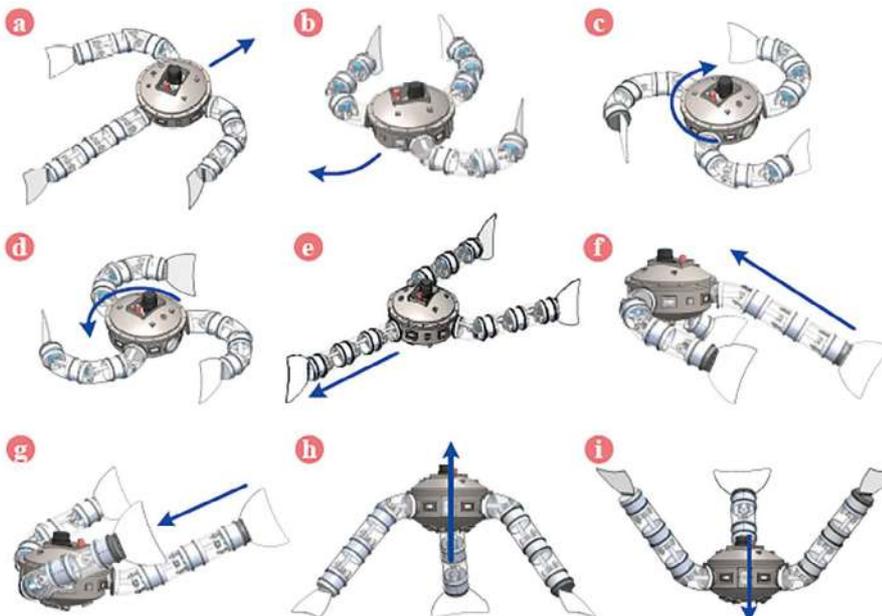

▲ Positioning performance using the 3D LiDAR Aided GNSS Precise Positioning

NOVEL FEATURES

∗ Adopts a software approach to provide robust and precise global positioning
∗ Intelligently integrates with autonomous vehicle-mounted sensors - No additional hardware and sensor setups cost!

BIO-INSPIRED MULTI-TAIL OMNI-DIRECTIONAL **UNDERWATER ROBOT - BIOMOUBOT**

▲ BioMOUbot - Omni-directional Motion Capability

With a bio-inspired approach, this new-generation underwater robot is innovatively designed by mimicking tadpoles, snakes and octopus with a round head and three or more snake-like tails. The robot can thus mimic different aquatic animal motions like a tadpole, octopus or frog and achieve high omni-directional motion capability in underwater environments. As such, it can be applied in many different underwater missions, such as underwater infrastructure inspection, aquatic animal tracking, coral reef studies and water quality monitoring.

NOVEL FEATURES

∗ Capable of diving into or suspending in water without a buoyancy mechanism, turning without a turning radius, and even moving on semi-water environment
∗ Its motion produces no engine noise at all

ENERGY, EFFICIENCY, ENVIRONMENT

ARTIFICIAL PHOTOSYNTHESIS OF CARBOHYDRATES
USING MICROFLUIDIC CHIP

It is well known that food production relies on natural photosynthesis in green plants. However, its energy efficiency is low due to the low activity and poor specificity of the first and most abundant enzyme D-ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCO) in green crops. To mimick natural photosynthesis with greater energy efficiency, this novel method is developed to immobilize the RuBisCO enzyme inside a microfluidic reactor, thereby facilitating the continuous production of the glucose precursor from CO_2 with high efficiency and high stability. This innovation represents a major advancement towards the artificial photosynthesis of basic food materials and paves the way to a scientific solution that beats the food shortage threat and prepares for future space colonization.
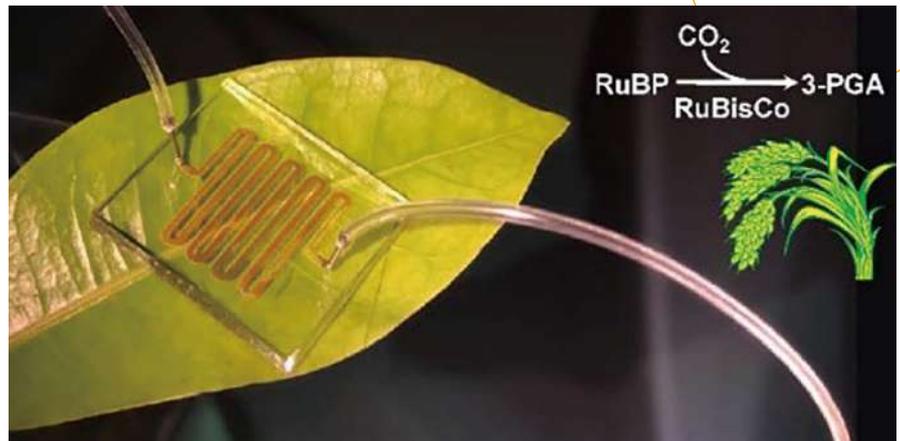
▲ Mimicking photosynthesis, artificial synthesis of carbohydrates are realized from CO_2 using RuBisCO via microfluidic reactors

NOVEL FEATURES

＊ Allows continuous production of carbohydrates with high stability and energy efficiency
＊ Possesses energy efficiency up to ~10% - much higher than that of natural photosynthesis (~1%)

GRADED SILICON-BASED ELECTRODE
FOR LITHIUM-ION BATTERIES

This technology tackled delamination problem by re-allocating the silicon nanoparticles in a layer-graded way in the electrode for lithium-ion batteries. The resulting graded electrodes exhibited much better electrochemical performance and higher utilizing efficiency of silicon in comparison to the homogeneous controls containing the same amount of constituent materials.
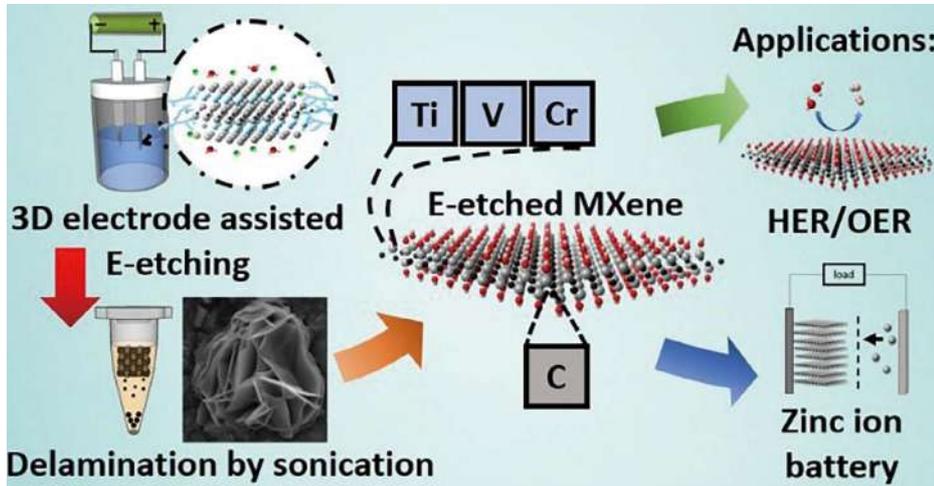
NOVEL FEATURES

＊ Possesses greater electrochemical performance
＊ Can be used with existing technologies
＊ Requires less fabrication facilities with cheaper cost

▶ Performance of the graded electrode
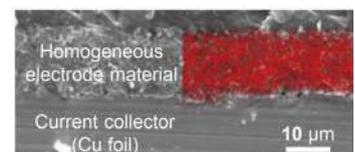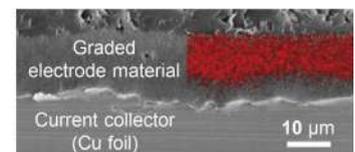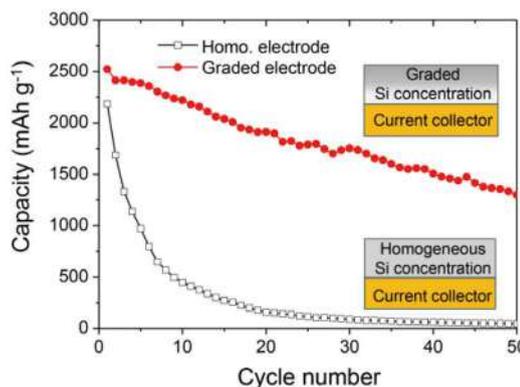
HF-FREE FACILE AND RAPID SYNTHESIS OF MXENES RELATED MATERIALS AND THEIR EFFICIENT ENERGY CONVERSION AND STORAGE APPLICATIONS

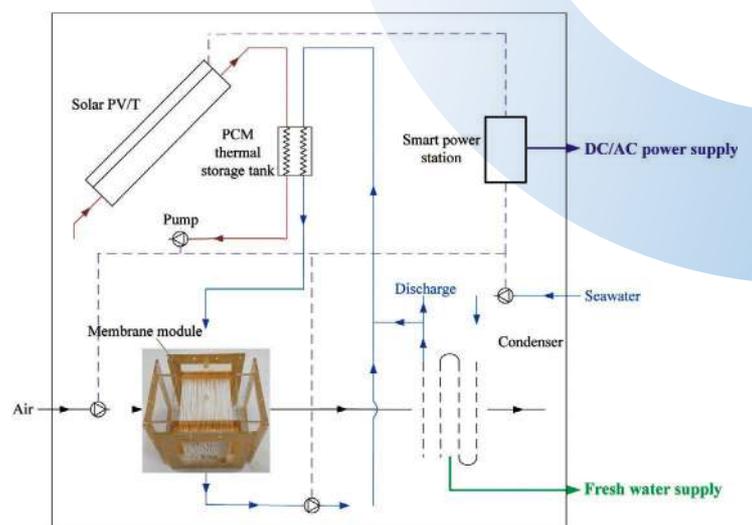▲ Schematic diagram of fabrication of HF-free MXene

MXene possess widespread applications in electrochemical energy storage and bio-imaging due to its high robustness and non-toxicity. However, traditional toxic synthetic routes require the use of highly toxic hydrofluoric (HF) acid to synthesize MXenes which raises considerable safety and environmental concerns. To overcome this problem, a HF-free electrochemical method is developed to synthesize MXenes. The resulting MXenes exhibits stable and highly efficient energy storage, offering promising applications towards fast-approaching raised energy crisis and demands.

NOVEL FEATURES

* Adopts a safe and environmentally friendly approach to synthesize MXenes
* Possesses high etching efficiency and short preparation time

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A FULLY SOLAR-POWERED STANDALONE MEMBRANE DISTILLATION SYSTEM FOR FRESH WATER AND POWER SUPPLY

A novel fully solar powered stand-alone membrane-based desalination system is developed to provide flexible fresh water and DC/AC power for remote households without reliable infrastructure, such as offshore islands and remote inland communities. In the system, a solar PV/T array is installed to provide both thermal energy and DC power respectively together with a smart power station and phase change material (PCM) thermal storage tank; in addition, a membrane-based desalination technology is adopted with a novel membrane module.

▲ Schematic diagram of the membrane distillation system

NOVEL FEATURES

* Presents a standalone membrane-based desalination system that is environmentally-friendly
* Produces high purity freshwater with the use of the hydrophobic membrane

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AWARD WINNING INNOVATIONS

ITDO NEWSLETTERS

ITDO INTRODUCTION

POLYU'S CONTRIBUTION IN COVID-19

3D-printed face shield for medical personnel

General use face shields ready for mass production

Rapid, automated multiplex diagnostic system for detecting up to 40 infectious respiratory pathogens (including novel coronavirus) in a single test