

COOPERATION OPPORTUNITIES WITH SABANCI UNIVERSITY

.. Sabancı ..
Universitesi

*“What good is an idea if it remains an idea?
Try. Experiment. Iterate.
Fail. Try again.
Change the world.”*

Simon Sinek

The Story

It all started back in 1997 when one of Turkey's most prominent family dreamed of a University, which will assume a leadership role with a fresh approach to research at a higher education institution. Since, Sabancı University has become one of the leading research and learning institutions in the country and it only took us 20 years... Imagine what we can do in the next 20!

Sabancı University is the first institution in Turkey to design its research programs around a truly interdisciplinary approach... This means there are no walls between labs, this means students are not confined to limited areas for course selection; this means there is an economics driven approach to advanced research and the impact of its outcomes.

Sabancı University is the first institution in Turkey to admit students based on their choice of Faculty instead of enrolling into a specific degree program, thus students are enabled to make informed decisions as to what they really want for a career.

Sabancı University Research and Graduate Policy Directorate (RGP) integrates the commercialization processes of new knowledge and technologies within a system. RGP ensures systematic management of research processes through its work on the planning, development and execution of projects, the implementation of long-term collaborative research efforts with private businesses, and its efforts on entrepreneurship, innovation, technology transfer and intellectual asset management. Industry Collaboration and Technology Licensing



Office (ILO), is a part of the Research and Graduate Policy Directorate responsible for the legal management of agreements and negotiations related to research projects, university-Industry Collaborations, personal consultancy projects and private sector services, intellectual property portfolio management, and technology licensing management.

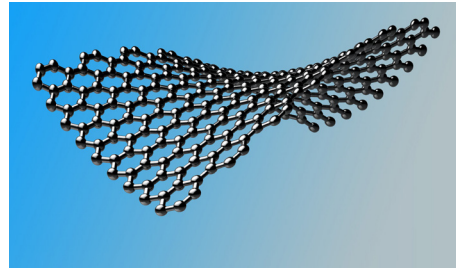
Sabancı University is the first institution to establish social responsibility projects, built into its formal curriculum. This novel approach to social responsibility has also become an academic model that we have proudly shared with many other universities.

In 2012, we became the first university to call for a consortium on the management of intangible property, including intellectual property as a result of research programs, and cooperated with **LES Turkey** to establish the **ARTEV** platform consisting of 5 leading higher education institutions in Turkey. (www.artevplatform.org)

The Intellectual Property Based Technology Transfer Collaboration Platform was established in 2016 with the support of 6 universities, LES Turkey, and the Technology Transfer Development Foundation to improve relations between Technology Development Zones and universities, helping to expand commercialization models. (<http://www.fmttisbirligiplatformu.org>)

Most importantly, Sabancı University was chosen **Turkey's Most Entrepreneurial and Innovative University** in 2016 and 2015, Turkey's Most Entrepreneurial and Innovative Private University in 2014 and 2013, and Turkey's Most Entrepreneurial and Innovative University in 2012. In a way, this summarizes the fruits of our dedication to innovation for the past two decades. Below are a few examples of our efforts to convert research outputs into social benefit through our national and international projects and partners.

Sabancı University is the only Turkish institution to take part in the **Human Brain Project (HBP)** and **Graphene (Graphene FET)** Flagship Projects, two breakthrough initiatives that will usher in a new era in modern science.



“Graphene” will investigate and exploit the unique properties of a revolutionary carbon-based material. Graphene is an extraordinary combination of physical and chemical properties: it is the thinnest material, it conducts electricity much better than copper, it is 100-300 times stronger than steel and it has unique optical properties. The use of graphene was made possible by European scientists in 2004, and the substance is set to become the wonder material of the 21st century, as plastics were to the 20th century, including by replacing silicon in ICT products.

The **“Human Brain Project”** will create the world's largest experimental facility for developing the most detailed model of the brain, for studying how the human brain works and ultimately to develop personalised treatment of neurological and related diseases. This research lays the scientific and technical foundations for medical progress that has the potential to will dramatically improve the quality of life for millions of people.



MILRES: The first wind turbine developed and produced in Turkey

The National Wind Energy Systems Development and Prototype Turbine Production (MILRES) Project is an R&D project supported by TÜBİTAK, and the beneficiary is the Ministry of Energy and Natural Resources. The project is implemented and coordinated by Sabancı University with partners TAI, İstanbul Ulaşım A.Ş., TÜBİTAK MAM and İstanbul Technical University, having a budget of TL 60 million and over 100 researchers involved. The objective of the project is to create the foundation for establishing a wind energy industry in Turkey where both design and technology are unique to Turkey and competitive on a global scale, expand the use of wind energy in Turkey, and raise the share of wind in Turkey's energy profile. The MILRES project was started in order to develop industrial-scale large wind turbines, and the first output was the development of a 500-KW turbine. This prototype will be the basis for a 2.5-MW turbine to be developed in the near future.

Technology Transfer at Sabancı University

A major aspect of Sabancı University philosophy and mission is to foster a research environment whereby the scholarly motivation behind basic research can pave the way for translational research which eventually will find its way to various application areas through start-ups, licenses and joint development efforts.

ILO is a major part of a process which starts with the creation of scientific discoveries and innovative applications. We refer to this process as Research and Technology Management. The value proposition will encompass the following:

- to create a vibrant technology commercialization environment
- be a role player in the innovation value chain
- to cause a positive change in the economic landscape

ILO is the interface between our corporate partners, faculty members and entrepreneurs. Our objective is to provide an extensive support environment where researchers and enterprises mutually enjoy opportunities for collaboration, cooperation and expansion of knowledge into markets for public benefit.

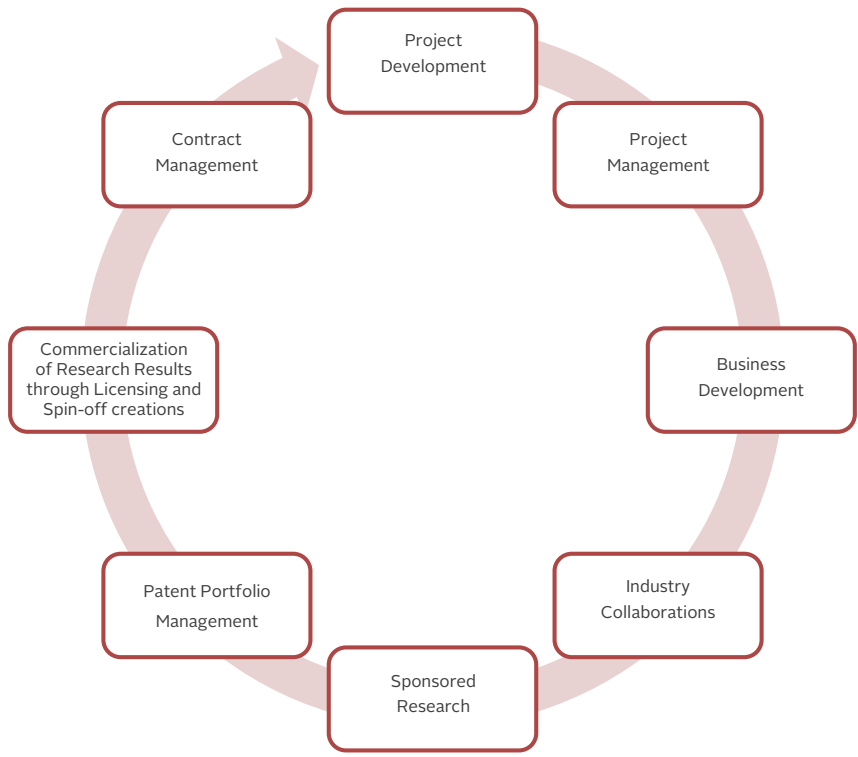


It takes a large team to manage technology transfer processes. With ILO, Project Development Office, Project Management Office, Research Planning and Policy Development Office, Inovent and SUCool, we add value to our outputs in collaboration with our academics, investors and industry.

We are aware that every business has its own needs and guiding principles. Therefore, one of the first steps we take is to ensure that institutions understand each other. Industry Collaboration and Technology Licensing Office (ILO) facilitates mutual understanding of needs and develops an appropriate value proposition between the industrial partner and faculty member while offering support regarding incentives. ILO team draft a confidentiality agreement to ensure that all information shared between the parties

is laid out comprehensively and that the parties are on the same page regarding this information. We assess government grants available to the joint initiative with a view to maximizing project economics and performance, and present the best and most appropriate funding options to the project partners. If the project has been shaped by this stage, we start working on the contract while also considering intellectual property and commercialization opportunities.

The end of this journey is the beginning of the next: we work with ILO after the conclusion of your project to facilitate the legal management of the cooperation, and to protect, register and commercialize project outputs for the most effective utilization of resources.



Last but not least, SU ILO has the privilege of benefiting from the world's largest technology and innovation database, the Enterprise Europe Network (EEN), through intense collaboration with the EEN node located in Sabancı University (SU-EEN).


Sabancı University is a partner research organization within the Enterprise Europe Network and with the support of the dedicated EEN staff, the utilized collaboration between SU EEN and SU ILO provides a mutual strength for maximizing the value of tech transfer in the region and globally. With the boost of the network, SU realizes its stronger potential of reaching out to industrial enterprises and academicians all around the world and vice versa.

The SU EEN team offers many services designed to provide technology transfer support especially for small and medium sized enterprises (SMEs) within the Istanbul Metropolitan Area and the Thrace region of Turkey at many levels. SU EEN experts help enterprises as well

commercialize new technologies and to receive financing from various EU related funding sources where providing advisory services on a broad range of issues such as IPR management, internationalization and EU laws-regulations.


The network brings together research and commercial applications from more than 50 countries using world's largest database of cutting edge technologies, containing more than 40000 cooperation profiles.



 www.een-istanbul.org

Contact:

 +90 216 483 97 10

 een@sabanciuniv.edu

TECHNOLOGIES FOR LICENSING

High Intensity Focused Ultrasound Keratoplasty

Summary

This invention relates to the application of ultrasonic waves for ocular imaging and thermal keratoplasty. With this specific technology we offer a device, a system and a method all together for performing thermal keratoplasty. The technology is expected to achieve the treatment of presbyopic astigmatism and hyperopia and even some cases of irregular optical aberrations by changing the shape of the cornea.

Keywords

Keratoplasty, ocular imaging, cornea surgery

Applications

Non-invasive refractive corneal surgery (mainly for regressive disorders)

Intra-ocular imaging

IPR Status

Application

Description

The ophthalmology market is experiencing an impressive global growth mainly due to the tremendous increase in demand for novel diagnostic technological platforms and efficient treatment methodologies.

The global Ophthalmology Devices market was valued at USD 26,012.6million in 2012 and estimated to reach a market worth USD 40,381.6 million in 2019 at a CAGR of 6.6 % from 2013 to 2019.

There are several corneal corrective surgery methods such as LASIK (laser-assisted in

situ keratomileusis), radial keratotomy (RT), photorefractive keratectomy (PRK) however unlike those methods, thermal keratoplasty (TK) offers a non-invasive procedure where corneal curvature is obtained by using heat. Among thermal keratoplasty methods conductive keratoplasty (CK) and laser thermal keratoplasty (LTK) are the two main techniques. With CK initial overcorrection is the major problem while LTK methods needs repeated applications over the years and the imaging and surgery systems work separately requiring complex and expensive equipment and longer operation times.

Herein, the presented technology offers a suitable device for thermal keratoplasty using high intensity focused ultrasound (HIFU) method. The device uses several ultrasonic transducers so that at least one of them is focused on the corresponding area of the cornea causing collagen shrinkage while another transducer is capable of receiving ultrasound waves for ocular imaging simultaneously. The use of several transducers brings two important outcomes. First, the corrective surgery and the ocular imaging are done at the same time thus reducing operational costs, saving time and improving efficacy. Second, there is no need of repositioning the device during operation, which brings simple operating procedures and leads to better patient outcomes.

Advantages

- Dual modality saves time and benefits cost performance.

Contact:

**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu

Autonomus Drug Delivery System for Pharmaceutical Applications

Summary

The technology enables the introduction of a therapeutic substance in the body and improves its efficacy and safety by controlling both the composition and the delivery conditions such as rate, time and place of release of the pharmaceutical drugs.

Keywords

Drug delivery, MEMs, controlled delivery

Applications

Medical field and pharmaceutical drug industry.

IPR Status

Grant

Description

The Micro Electro Mechanical System (MEMS) industry has an exponential growth potential in today's market. Nowadays, MEMS industry is targeting prominently life sciences and applications. Due to MEMS technologies, innovative and new in vitro diagnostic systems, therapy strategies, targeted and intelligent drug delivery processes emerged in biomedical field and they have the potential to revolutionize the entire healthcare system.

With conventional drug delivery systems (oral and intravenous) adjusting the drug concentration to reach the target site inside the body are highly challenging therefore unnecessarily heavy doses are frequently administered to patients causing harmful side effects. Autonomous drug delivery systems using MEMs technology

allows tuning the drug concentration to the necessary minimum by administering the therapeutic substances directly to the site of interest. Hence harmful side effects are avoided by limiting the exposure of the healthy tissues to the drugs and the drug's efficacy is increased.

Herein, the offered "autonomous drug delivery technology" have features of passive reagent mixing via hydrodynamic cavitation allowing fluid flow due to surface tension gradient created inside the device by non-homogenous distribution of nanostructures and effective heating due to enhanced surface area with pin fins. After the mixing and heating processes, the system transfers ingredients into another chamber in order to adjust the desired properties of mixture and delivers the substances to the site of interest.

Advantages

- Controlling all processes (passive conveying, mixing, heating) in one device
- Increased safety due to control of the quantity of reagents and an in-situ heating operation.
- Homogenous mixing of multiple reagents.
- Increased efficacy both in terms of drug composition and targeted delivery.
- No need for external power source.

Contact:

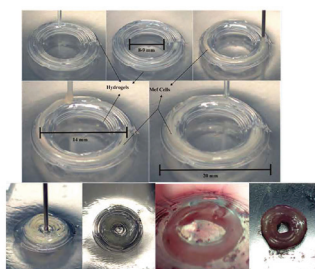
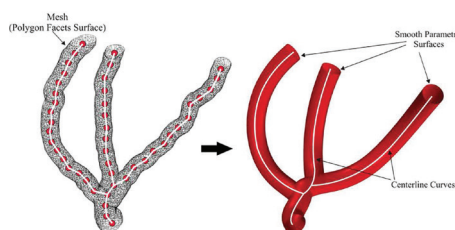
**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu

ID No: AGZ-03-SUP026

Cavitation Apparatus for Medical use for Treatment of Kidney Stones, Prostate, Hyperplasia and Cancer Cells

Summary

The technology relates to the use of a hydrodynamic cavitation device for the treatment of urological diseases such as prostate growth, cancer and kidney stones. The presented apparatus offers a cost-effective and energy efficient treatment tool with a highly localized effect. This device utilizing “hydrodynamic sources” can be used for a variety of treatments such as destroying kidney stones or killing infected cancer cells.



Keywords

Hydrodynamic cavitation, cancer, kidney stones, microchannel, cavitation damage

Applications

Healthcare Applications:

- Destruction of kidney stones
- Treating Benign Prostate Hyperplasia,
- Destruction of infected cancer cells

IPR Status

Granted

Description

Hydrodynamic cavitation occurs when the pressure of a liquid drops and then subsequently increases, allowing the formation and implosion of gas bubbles creating a “burst of energy”. This energy can be directed on desired surfaces where the destructive energy of the shock waves can be used for therapeutical purposes in common diseases such as kidney stones or prostate growth. Ultrasound therapy is a non-invasive treatment, where some difficulties are faced in targeting the precise location (kidney stone, cancerous prostate tissue) of the treatment and the energy requirement of ultrasound therapy makes this method of treatment expensive.

In most cases, hydrodynamic cavitation is also not desired since the hydraulic devices are susceptible to catastrophic damage due to erosion with bubble collapse and subsequent high velocity liquid jets. However the device provided by this specific technology overcome these issues since it is specifically designed to exploit cavitations for biomedical treatment.

This cavitation apparatus including nano/micro size flow restrictive channels generates continuous micro/nano sized bubbles. Generated hydrodynamic bubbly cavitation is highly destructive on the target surfaces once they are localized. This device can be utilized for a variety of treatments due the advantages of localization with the

use of vision based control components and micromanipulators. Localization plays a key role in preserving the healthy tissues from destructive effect of the treatment compared to ultrasonic applications. These features of the technology result in more economical, energy efficient, and multipurpose medical device.

The destructive energy coupled with a cost effective device well overlaps with the therapy duration ranges of the other methods. Furthermore, the diameter of the cavitation probe is designed to fit into a regular endoscopy device making the developed technology a highly suitable tool for medical device manufacturers especially for the endoscopic surgery sector.

Global ultrasound based device market is expected to reach USD 8.71 Billion in 2019. This device presents an attractive alternative and cost effective solution for medical device manufacturers

Advantages

- Cost effective
- Multiple Use
- Energy Efficient
- Multi-purpose medical device

Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu

ID No: AGZ-04-SUP069

3D Bio-Printing of Artificial Biological Tissue Networks

Summary

The developed technology is about the 3D Bio-printing of artificial biological tissue networks. This 3D Bio-printing method provides a branched, self-supporting, scaffold-free artificial hollow biological tissue network for the replacement of living tissue.



Keywords

3D bio-printing, tissue engineering, artificial biological tissue, scaffold-free networks

Applications

Healthcare Applications:

The targeted application areas of the technology are medical, healthcare and the biotech R&D industries.

IPR Status

Application

Description

transplantation) has limitations due to lack of donor and patient conditions. Moreover entire biomimetic

Currently, biologic or synthetic scaffolds are used in tissue engineering for cell attachment, proliferation and differentiation. However it is yet extremely challenging to produce a porous 3D scaffold with desired internal architecture to mimic the extracellular matrix allowing functional vascularization for nutrition and oxygen support. Vascular tissue engineering is not able to produce an entirely biomimetic blood vessel due to poor mechanical properties. On the other hand scaffold-free approaches such as valve scaffold tissue engineering has the potential to fabricate blood vessels through hydrogel materials but the process of tissue formation can take a long time and some of the hydrogel material could cause immune reactions due to degradation.

To overcome above-mentioned shortcomings this technology provides a branched, self-supporting, scaffold-free artificial hollow biological tissue network for replacement of living tissue. This computer-controlled 3D bio-printing technique achieves a natural mechanical strength in a shorter time, with a high reproducibility and without requiring any manual intervention. Users can print living cells into reproducible and realistic tissue and organs without the need for supporting scaffolds. These can then be used directly for transplantation.

Advantages

- The present method offers an artificial biological tissue network with ;
- High reproducibility
- A natural mechanical strength obtained in a shorter time
- A bottom-up construction process
- Formed directly based on medical images of the targeted tissue or organ
- A branched self-supporting scaffold-free artificial hollow biological tissue network for replacement of living tissue.

Contact:

**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu

A Nanoplasmonic Device for High Performance Nanotechnology Products

Summary

Nanoplasmonics deal with creating ultra-compact components for nanoscale photonic devices to match their electronic counterparts. Focusing on control and manipulation of plasmons at nanometer dimensions, nanoplasmonics combines the strength of electronics and photonics, and is predicted to replace existing integrated circuits and photonic devices. It is one of the fastest growing fields of science, with applications in telecommunication, consumer electronics, data storage, medical diagnostics, and energy.

In these devices localized heating is an important problem. Bulk metallic layers are generally used to remove heat, which results in spreading the heat and causing a general heating.

This technology will play a crucial role in breaking the technical limits that are encountered in various products. For example, a successful integration of this technology with hard disc drives will extend the annual increase of data storage capacity at or above 40 %, which has been slowing due to the super paramagnetic limit. A successful integration of this technology with hard disc drive heads and media will allow the hard disc drive to break the technical limits, and therefore, will allow the existence and growth of this important technology. There are even bigger markets that can utilize this technology, such as the semiconductor industry and solar cells. Since the offered technology is the first

example providing localized cooling at the nanoscale, it becomes attractive for a number of emerging nanotechnology products.

Keywords

Nanoplasmonics, consumer electronics, data storage, telecommunication, energy

Applications

- Consumer electronics
- Data storage
- Medical devices
- Telecommunication

IPR Status

Granted

Description

This specific technology offers a novel nanoplasmonic device with nanoscale cooling affect providing satisfactory cooling in an efficient and compact manner for various products such as in hard disk drives in computing and sensor systems.

The device comprises a unique “nanoplasmonic layer” having a heating side and a cooling side and also includes a cooling structure adjacent to the cooling side of the “layer”. The localization of these cooling structures is engineered for rapid cooling and focused cooling effects-minimizing any heating related performance loss in real life applications. The overall design of this novel device enables to remove heat from the layer effectively in a compact manner. This technology will play a crucial role in breaking the technical limits that are encountered in various products. For example, a successful integration of shorter time, with a high reproducibility and without requiring any manual intervention. Users can print living cells into reproducible

and realistic tissue and organs without the need for supporting scaffolds. These can then be used directly for transplantation. this technology with hard disc drives will extend the annual increase of data storage capacity at or above 40%, which has been slowing due to the super paramagnetic limit.

Advantages

- The present method offers an artificial biological tissue network with ;
- High reproducibility
- A natural mechanical strength obtained in a shorter time
- A bottom-up construction process
- Formed directly based on medical images of the targeted tissue or organ
- A branched self-supporting scaffold-free artificial hollow biological tissue network for replacement of living tissue.

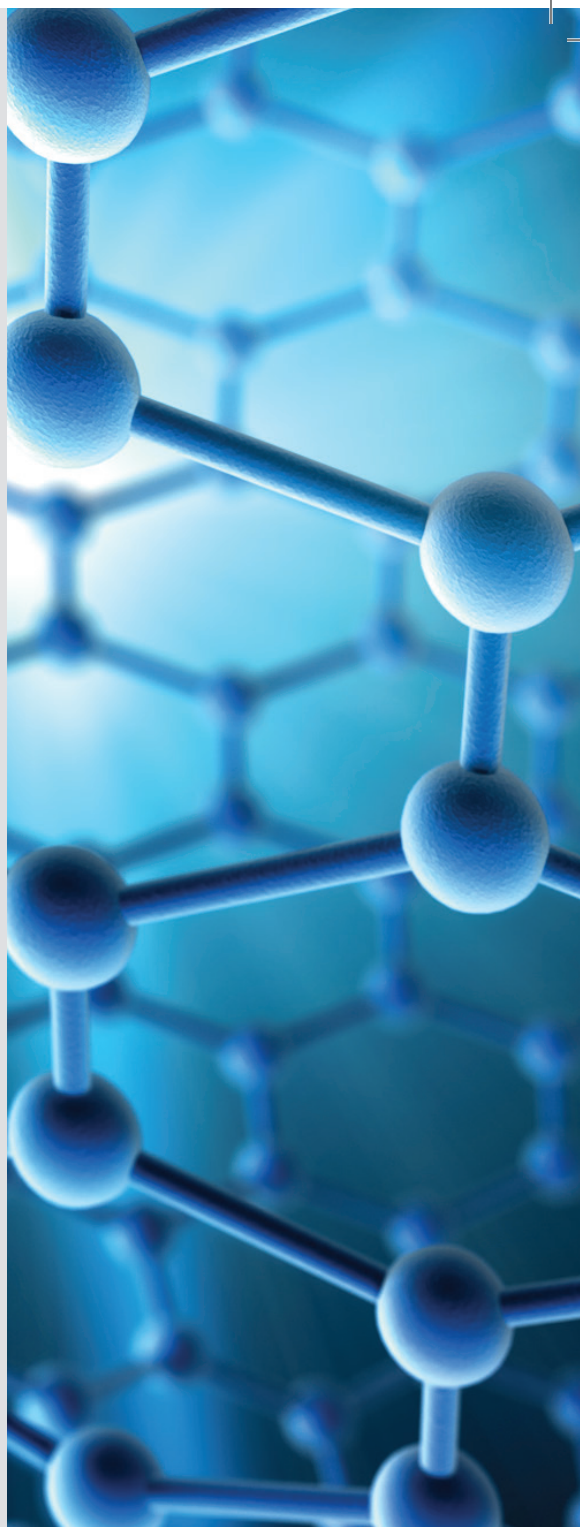
Potential Applications

This technology may serve to semiconductor industry, software/hardware industries, energy and environment as use in near-field imaging applications, solar cells, nanolithography, optical data storage, heat assisted magnetic recording, light emitting devices, spectroscopy, medical applications, bio-chemical sensors, femtosecond pulse shaping, single molecule spectroscopy, single molecule fluorescence enhancement, and plasmonic waveguide.

- Effective, rapid and focused cooling effect
- Minimized performance loss in real life applications
- Compact manner

Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu



ID No: AGZ-o6-SUPo65

Active Food Packaging Material

Summary

Contrary to conventional food packaging that is inert to the food; active food packaging has the ability to act against the contaminants and to remove them. This technology presents the use of the polymeric films comprising of halloysite nanotubes as a packaging material for food products. The said halloysite nanotubes are incorporated with active agents, such as antibacterial agents (preferably from a natural source) for providing antibacterial, barrier and ethylene scavenging properties.



Keywords

Packaging, material, food, antibacterial

Applications

Active food contact materials absorb or release substances in order to improve the quality of packaged food content or to extend its shelf life. With the additional antibacterial properties, this effective

and efficient active packaging technology offers new and exciting opportunities for (but not limited to) food packaging.

IPR Status

Granted

Description

Active and multifunctional packaging materials are facing increasing demand because of the changing trend of the customer needs such as safety and long shelf life of the food material without however interfering with processed materials, preservatives and additives. In order to have safe active food packaging it is crucial to choose active packaging material through incorporation of antibacterial agents. This technology presents the use of the polymeric films comprising of halloysite (aluminosilicate clay) nanotubes as a packaging material for food products. The said halloysite nanotubes are incorporated with active agents, such as antibacterial agents (preferably from a natural source) for providing antibacterial, barrier and ethylene scavenging properties.

Advantages

This technology has the following advantages:

- Ability to absorb and release substances that enables the function of the active packaging
- Providing antibacterial, barrier and scavenging properties all within the same product
- Active food packaging properties without using detrimental and harmful agents to human health
- Uses sustainable raw materials
- Easily recyclable



Customer Benefits

Food packaging materials with barrier properties against atmospheric gases, water vapor and volatile compounds are required to maintain the shelf life of its contents. This technology features the following benefits:

- More cost effective
- Safer methods by using a packaging material incorporated with halloysite nanotubes
- Efficient and able to provide good antibacterial, barrier and scavenging properties in the specific area of food products

Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu

ID No: AGZ-07-SUP038

miRNAs for Diagnosis, Prophylaxis and Treatment of Autophagic Diseases

Summary

This novel technology introduces an efficient way to identify the cellular degradation in cellular functions by utilizing specific miRNA families to diagnose existing or potential pathologies enabling fast and efficient diagnosis, prevention and therapy of a wide range of autophagy-related diseases such as cancer, alzheimer's, early dementia and hereditary diseases.

Keywords

miRNA, diagnose, autophagy-related diseases, cancer, alzheimer's, early dementia

Applications

This class of miRNAs has potential applications in diagnosis, prophylaxis and treatment of diseases involving autophagic abnormalities such as:

- Neurodegenerative and nervous system diseases
- Cancer
- Heart and liver diseases
- Ageing
- Myopathies
- Autoimmune and inflammatory diseases and immune deficiencies
- Infectious diseases
- Ischemic diseases
- Diabetes
- Axonal injury
- Lysosomal storage diseases

IPR Status

Granted

Description

MicroRNA-based research for diagnostics and treatment is a promising emerging field in drug research and several large

pharmaceutical companies have already invested substantially into miRNA-related research and therapeutics. (see Melnikova I, Nature Reviews in Drug Discovery 2007). The total global microRNA market was valued at nearly US\$338.3 million in 2012 and expected to reach US\$763 million in 2017 after increasing at a five-year compound annual growth rate (CAGR) of 17.7%.

This invention as potential candidate for drug and diagnostics development is timely to meet the growing demands of this new market segment. RNA therapeutics offer the advantage of low cost synthesis and stability, and as organic molecules that can be targeted specially are anticipated to have less side effects on patients.

Advantages

Therapeutics and diagnostics can be designed around these miRNAs to enable efficient and fast ways to diagnose, prevent or treat diseases arising from excess autophagy by blocking autophagic pathways in cells. Conversely, the diseases occurring because of deficiencies in autophagy can be controlled by suppressing these miRNAs with inhibitors, thereby reinstating autophagic pathways.

Customer Benefits

- miRNAs are generally more stable than proteins and other forms of RNA, hence are suitable candidates for incorporation into point-of-care diagnostic kits
- miRNAs are organic molecules and natural antisense interactors
- miRNA expression profiles can be used to diagnose disease states as deregulated miRNAs contribute to the initiation and development of diseases

Contact:

**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu

ID No: AGZ-o8-SUPo71

Higher Order Tensor Based Vascular Modeling

Summary

This invention presents a new method for extracting a whole vessel tree using Higher Order Tensor (HOT) flux-based tractography idea. This method offers seamless modeling of the n-furcations jointly with tubular sections within the same space mathematical model.

Keywords

Extracting, Higher Order Tensor (HOT), flux-based tractography, n-furcations

Applications

- Stand-alone usage by doctors for visualizing and examining patient's vascular structure
- Usage by medical laboratories for analysis of patient vascular data
- Making measurements for monitoring health of vascular structures such as; coronary arteries, cerebral arteries or veins for a patient
- Detecting pathologies in the vascular stenosis in coronaries or cerebral aneurysms in cerebral vascular

IPR Status

Granted

Description

Extraction of vascular structures such as coronary and cerebral arteries is an important step in detection and analysis of vessel anomalies and pathologies such as aneurysms, stenosis and plaques. This novel technology brings a new solution that using computer algorithms to extract patient-specific vascular models using patients'

own medical imaging data (Computed tomography, MRI etc) are needed.

Advantages

The problem of patient-specific vascular tree modeling an initial segmentation step that produces a 3D segmented volume has to be followed by a external mesh construction scheme to model n-furcated vessels for mesh editing and further modeling.

First novelty of this technology extracts the vascular surface together with modeling of the n-furcation of the vessel.

Second distinctness is the introduction of asymmetry into the higher-order tensor modeling by carrying the space from 3-Dimensions to 4-Dimensions. These features provide well fit to problem of n-furcation modeling in the vessel.

Customer Benefits

- Increased efficiency for analyzing their patient's data
- More accurate models of patient vasculature
- Faster than previous technologies, only few seconds to extract the whole vascular tree
- Low cost stand-alone software

Contact:

Industry Collaboration and Technology Licensing Office tto@sabanciuniv.edu

Magnet Movable Linear Motor

Summary

There is a growing trend of buildings becoming taller. As a result, floor space that is needed for elevators has also increased accordingly. This need not be the case if more than one cab shares the same elevator shaft. However, traditional elevators are severely limited by the number of cabs that can share the same shaft because of the ropes, pulleys and counterweights that gets in the way of each other. This magnetic linear motor technology is suitable for use to replace the current system besides generating greater thrust force it can also accommodate multi-cabs in a single shaft.



Keywords

Elevator, magnetic, linear motor.

Applications

This technology is applicable for (but not limited to) the following applications:

In vertical applications:

- Elevator for moving heavy goods in industrial buildings
- Multi-car elevator for human transport in buildings

In horizontal applications:

- Parts conveyor for individualized products
- Actuators for machines or equipment
- X-Y tables for machine tools or equipment

IPR Status

Granted

Description

Modern high-rise buildings reaching kilometer heights are restricted not by structural integrity but by difficulty of transportation. Larger and larger floor spaces must be sacrificed to carrying humans, goods, power, pipelines etc. and in the extreme case, the lower floors cannot be used for anything except as a passage to higher floors, at which point, it does not make sense to build any higher. One of the most promising solutions to decrease the area lost to elevators is to use the concept of multi-car elevators where several elevator cars run in each hoistway, managed by a comprehensive group control algorithm. However, this method can only be used if the traction cable is eliminated, and the elevator car is self-propelled.

In collaboration with a major Japanese elevator company, a full-scale vertical linear synchronous motors for elevator applications have been developed, designed, built and tested. Through this enabling technology, multi-car elevator systems have become a possibility, as well

as ever higher buildings, and buildings with a curvature! New methods proposed which drastically cut down the design time of the magnetic components of the motor (stator and mover geometries, material, winding design, etc.), with respect to optimizing costs of materials, and parameters such as speed, torque, vibration etc. The design has outstanding force-to-weight ratio because of the nonlinear design method and this technology has been tested and we are seeking for commercialization partners to bring it into the market.

Advantages

The fully functional design is capable of operating a 3-4 person elevator car within speeds allowed by the local regulations, using available building power. A patented method was developed to allow installation of the motor in tight spaces along the hoist way. Traveling cables have been completely eliminated by the technology, including traction, position sensing, power transfer and emergency overspeed braking. In a commercial implementation, the system is envisioned to be delivered from the factory in 6m long sections, which include power and communication cabling, to be installed directly in the hoist way. Linear motor driven elevator systems do not have counterweights as in conventional elevator systems. The power required during operation is carefully balanced where elevator cars going up are partly powered by the recovered energy from those going down. Having smaller cars, the system does not need to move large dead weights for a small number of people traveling. Overall, this means that the power required by the elevator systems can be smaller than conventional elevators. An operational 3m full size, functional prototype is available for inspection.

Customer Benefits

- Multi-car elevator enabling technology
- Significant reduction in floor space dedicated to elevators
- Can be applicable both in horizontal and vertical orientations
- Greater thrust-force/dead-weight ratio than conventional linear motors
- No need for expensive magnets
- Novel emergency braking mechanism
- Fewer moving parts
- Easy transport of goods/loads along a rail track for long distances

Contact:

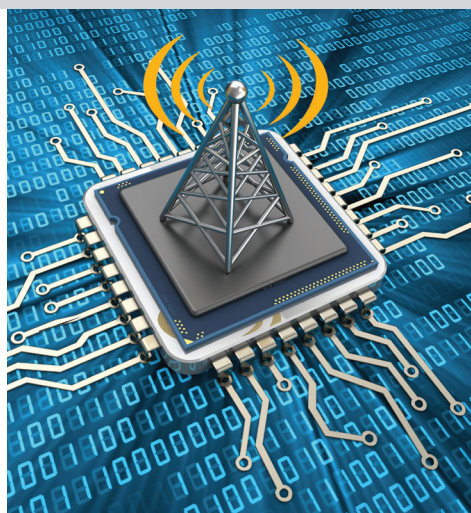
**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu

ID No: AGZ-10-SUP053

Cooperative Mac Protocol With Relay Selection and Power Control

Summary

The improvement of the wireless channel quality is beneficial, not only from the communications perspective but also from the energy perspective, due to potential reduction in the energy costs of data transmission, reception, re-transmission(s) and interference. The quality of the wireless channel can be significantly improved by antenna diversity and multiple output techniques, as the receiver is provided with multiple copies of the original signal through independent fading paths, resulting in diversity gain. This invention relates to wireless networks wherein a more energy-efficient architecture is used and the hardware limitations and the power consumption cost of the wireless nodes are optimized.



Keywords

MAC protocol, wireless channel, wireless networks, energy-efficient architecture

Applications

Wireless network.

IPR Status

Application

Description

The present invention is a medium access control (MAC) layer implementation allowing cooperation in a wireless network by taking into account the operation and overhead of employing cooperation in each layer by accurately modeling the parameters of each layer as well as application-specific performance requirements. The Cooperative MAC (COMAC) protocol framework is a strong candidate for improving the state of the art of Zigbee WSNs for IoT. COMAC brings about significant performance improvements with very simple changes in the MAC layer to allow optimal cooperation in the physical layer.

Advantages

The present invention proposes a method of communication in a wireless relay network for finding group of relays that minimizes total energy consumption to send one successful bit to destination node, under reliability condition expressed in terms of average BER level, said method comprising three main phases in the manner that a reservation stage where cooperative data transmission request is made by the source node, an ACO epoch, where the announcements of the candidate relays are sent, the cooperation set is formed and power levels are assigned, and the cooperative data transmission stage itself, are defined.

Customer Benefits

A cooperative medium access control (MAC) framework is proposed for improving the performance and energy efficiency of WSNs, while satisfying a given reliability constraint. The energy-reliability trade-off is achieved through a relay selection and power assignment algorithm, which is implemented within the COMAC cooperative MAC protocol that enables the coordination of candidate relays, calculation of the decision metrics, selection and actuation of the relay nodes with optimal power levels for cooperation. The proposed cross-layer MAC framework is evaluated in terms of energy costs as well as network performance metrics, in terms of throughput, delay and overhead. It is shown that the network throughput can be improved significantly, while the energy consumption is reduced by at least two orders of magnitude as compared to standard Zigbee WSNs, at negligibly small overhead and computational costs.

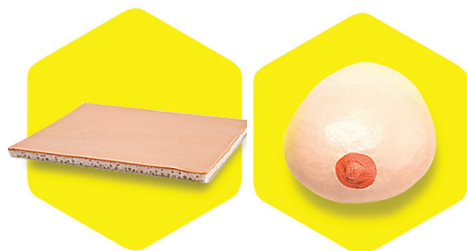
Contact:

**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu

Startup: A Composite Structure for Surgical Training-Surgitate

Summary

Surgitate produces synthetic tissue and organ models for surgery training. Our products provide a realistic feel of incision, dissection, and suturing. We have breast, skin, and vascular models in our product portfolio and our target customers are surgeons-in-training (e.g., medical and veterinary school students). We also have a self-diagnosis model to be used for breast cancer awareness. We aim to improve the quality of surgical trainings via our practical and tactile simulation platform.



Keywords

Surgical models, breast implants, skin models, self-diagnosis, breast cancer

Applications

There are different types of skin pads, vascular models, and breast models of different sizes to practice a variety of techniques from basic suturing to vascular trauma surgery. In addition to the breast models for medical training, the company designed an additional self-diagnosis breast model that can be used to teach women how to check their breast for possible lumps.

IPR Status

Secret Know-How

Description

One in eight women experiences breast cancer at some point in her life. Medically and aesthetically successful surgeries assure the health of these women pre-cancer lives. There are more than ten different types of oncoplastic in these techniques scales with skills of surgeons.

Surgitate fabricates models that surgeons can

1. cut with scalpel and scissors
2. sew
3. remove a small/large volume and sew
4. feel malign/benign tumors nipple.

This tactile simulation platform will assist surgeons to improve their surgical skills and facilitate their learning process.

Most of the surgical simulation market is based on digital tools and haptic interfaces. Tactile simulation platforms have a potential to offer a more traditional and accessible medium for training.

Advantages

Four marketing venues to focus on are:

1. organizers of small conferences and workshops with special focus (e.g., breast cancer)
2. large companies that organize or provide to large conferences (e.g., suture companies that market their products with the aid of synthetic models)
3. medical schools with simulation laboratories
4. individual sales to medical, veterinary, and nursing school students

Customer Benefits

Training medical students' and young surgeons' practical skills is essential. The models developed by Surgitate can serve as a platform on which senior doctors can teach junior staff and medical students, students.



Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu

TECHNOLOGIES FOR
FURTHER DEVELOPMENT

Recovery of Water and Chemicals From Industrial Wastewater By Membrane Technologies

Description

The aim of the project is to develop solutions to problems in membrane technologies such as low flux, high cost and operation difficulty by developing new generation purification processes and membranes, which will be put in the form of a membrane module for the purpose of improving the wastewater purification efficiency.

Textile industry uses excess amount of water due to the required process. As a result of various processes, the wastewater with different characteristics that come out of various processes during the manufacturing of the textile material is discharged from the purification plant. Especially fiber production results in wastewater with high concentration of dissolved contaminants and therefore this wastewater has a high level of salt and dense color due to complex and polar dyes. This colored and high pH wastewater is purified with traditional methods biologically; however, color and salt removal is not achieved. The quality environment where this kind of wastewater is collected deteriorates quickly and ruins other uses of this water. As a result, legal wastewater discharge limits have been tightened every year and wastewater purification has been becoming a huge issue for the textile industry.

A multidisciplinary research team from Sabanci University, Istanbul Technical University, Yalova University and ESAN Eczacıbaşı gathering from polymer chemistry, material science and engineering, metallurgy engineering and environmental engineering disciplines to synthesize and

develop novel polymeric and monomeric materials, and nanocomposites to produce membranes and modules in laboratory and pilot scale for new generation membrane technologies.

Potential application areas

Organic pollutant, dye and color and salt removal **membrane and modular waste water treatment systems for industrial wastewaters**

Technology Readiness Level 5

- Novel hybrid nanomaterials have been developed from local raw materials for the photocatalytic degradation of organic and dye pollutants in wastewater,
- Novel ultrafiltration and nanofiltration membranes with improved performance compared to the state-of-the-art for the removal of organic contaminants and salts have been developed from newly synthesized polymers, monomers and their nanocomposites.

This research is supported by The Scientific and Technological Research Council of Turkey (TUBITAK) grant number 113Y350

Further developments required for commercialization, sought expertise from the potential partner

The technology developed within this project offers customized modular solutions for every potential user. For commercialization purposes, needs and requirements of potential users can be identified and the custom technology/system can be developed and verified in laboratory and pilot scale.

ID No: AGZ-02-COOP002

Development and application of handwriting recognition and analysis technologies

Description

The aim of the project is to develop handwriting recognition technology for the Turkish language and to implement it in tablet based learning system in elementary schools.

Potential application areas

The technology can be implemented in schools with **tablet-based applications** for 1st and 2nd grade elementary school students. This technology will enable the students to do their homework and school studies directly from their tablets, which can be evaluated and reported instantaneously.

Technology Readiness Level 4

Further developments for commercialization and sought expertise from the potential partner

An industrial partner experienced in developing educational software is required for further development of the technology. The partner shall be able to prepare samples from hard copy course materials and transfer the content into the online platform. Further more a system for synchronous data transfer regarding the downloading the content from the server and uploading the input from the student is also needed.

Contact:

Industry Collaboration and Technology Licensing Office tto@sabanciuniv.edu

ID No: AGZ-03-COOP003

Design and Development of a Pem Cell With Very High Hydrogen Utilization and Development of Alternative Materials for Improved Performance and Durability

Description

In this project, anode and cathode flow channels for a PEM fuel cell (PEMFC) with a large active area are designed, manufactured and tested at ultra-low stoichiometric flows at the anode exit. Flow and cooling channels, which are appropriate for these operating conditions and thermal management system, are optimized by using computational models. The new design aims to achieve a high hydrogen utilization rate without the need for a hydrogen recovery system.

Parallel to the improvements in the system design, novel membrane, electrode and catalyst materials are developed to address adverse effects (i.e. membrane degradation, dry-out, carbon corrosion, etc.) of fuel starvation and the high cost of PEMFC systems (i.e. cost of platinum). New materials are characterized and tested in a small single-cell PEMFC operating at DEA and ultra-low anode stoichiometric flow conditions.

Potential application areas

Because of the high-energy storage density and simplification of the system, the new design is convenient to use in **all fuel cell vehicles**.

Technology Readiness Level 4

Further developments for commercialization and sought expertise from the potential partner

Partners are sought with the expertise of manufacturing of metallic bipolar plates, control and testing of fuel cell systems.

Contact:

Industry Collaboration and Technology Licensing Office tto@sabanciuniv.edu

ID No: AGZ-04-COOP004

Development Of New Generation Polymeric Nanocomposite Insulation Materials Containing Nanoparticles With High Thermal Resistance and Extreme Flame Retarding Properties

Description

The aim of the project is to develop high performance and multi functional building insulation materials for the construction industry. The developed material is extremely difficult to inflame, has a low thermal conductivity, a high radiation resistance and with heat storing ability via phase change mechanism. It is in the form of polyurethane foam / film forming composite with enhanced mechanical performance.

Potential applications

The material can be applied in energy, construction and defense industries.

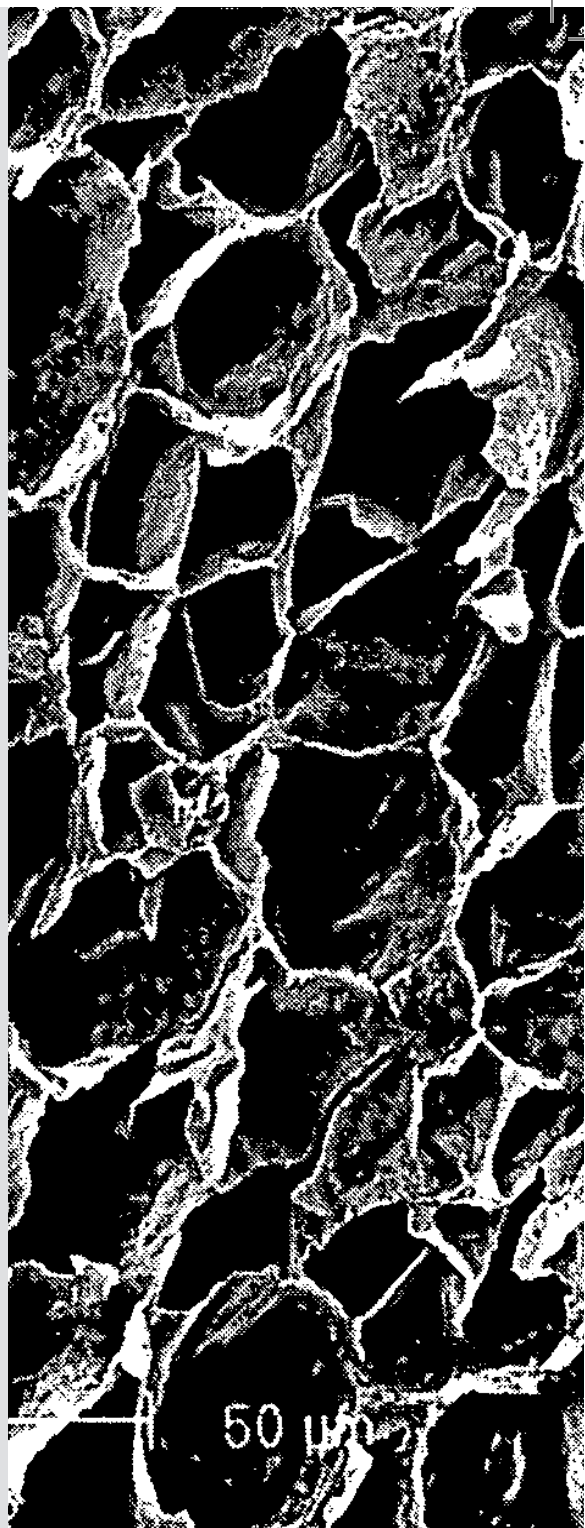
Technology Readiness Level 3

Further developments for commercialization and sought expertise from the potential partner

We are in the stage of developing prototypes of this material. An industrial player in the aforementioned fields is necessary to identify the market requirements and to customize the material technology according to industry specific needs.

Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu



ID No: AGZ-05-COOP005

A Label-Free Hand Held Point-of-Care Device for Detecting Cancer and Cardiovascular Disease (Cvd) Biomarkers



Description

The detection using this device is based on the principles of lab-on-chip platform. Here, we first designed, optimized and developed bio-functionalized electrical capacitor sensors interfaced with a lab-on-chip tool device that was utilized for detection of single and multiple biomarkers specific to cancer and CVD. The developed medical prototype is comprised of a capacitive bio-detection chip, microfluidic, sensitive capacitive readout electronics and data analysis software which interpolates quantity of biomarkers in each test serum sample. Capacitive bio-detection chip is based on interdigitated circular lines or electrodes, which is pre-activated with single (for detecting one biomarker) or multiple antibody types (for detecting multiple disease biomarkers). Working principle of capacitive biosensor is based on the interaction of antibody and antigens

on capacitive chip that causes change of capacitance, which is reflected on the readout display by sensor electronics.

Potential applications

Early detection and diagnosis of most common and life threatening diseases, such as various cancers and cardiovascular disease (CVD) has always been the primary focus in clinical diagnosis. There has been a continuous effort to develop new tools or improving existing methods, sensitivity, specificity, and detection time for early disease diagnosis. Enzyme linked immunosorbent assay (ELISA) based detection of various disease biomarkers has been the most commonly used method in detection and quantification of disease biomarkers. However, such assays utilize not only expensive reagents and long time, but also require trained individuals and dedicated laboratory to run such assays. Therefore, development of a less expensive, rapid, simple and point-of-care device is a necessity in today's technological expectations.

The developed lab-on-chip device prototype combines innovative label-free features for point-of-care application, which is portable, hand-held, fast and low cost healthcare platform that can be used to diagnose CVD and cancer through detecting single/multi biomarkers representing single/multi diseases. This device can be used without having to rely on expensive and time-consuming laboratory tests. The prototype device is capable of on-site diagnosis and the result is reported in less than 30 minutes. From this perspective, the project is well suited with subject of call "Diagnosis, treatment and support based innovative health care devices", and the device developed carries the essential features of fast, on-site, low cost and accurate diagnosis and prognosis of the cancer and cardiovascular diseases.

Thus, the proposed prototype is truly a competitive healthcare device that has been tested and verified in collaboration with Anadolu Sağlık Merkezi with 16 real patient blood samples for seven different disease markers. Application of the developed device not only addresses the disease diagnosis but also contributes to overall survival of the suspected patients and thus enhance the socio-economic well being of the country.

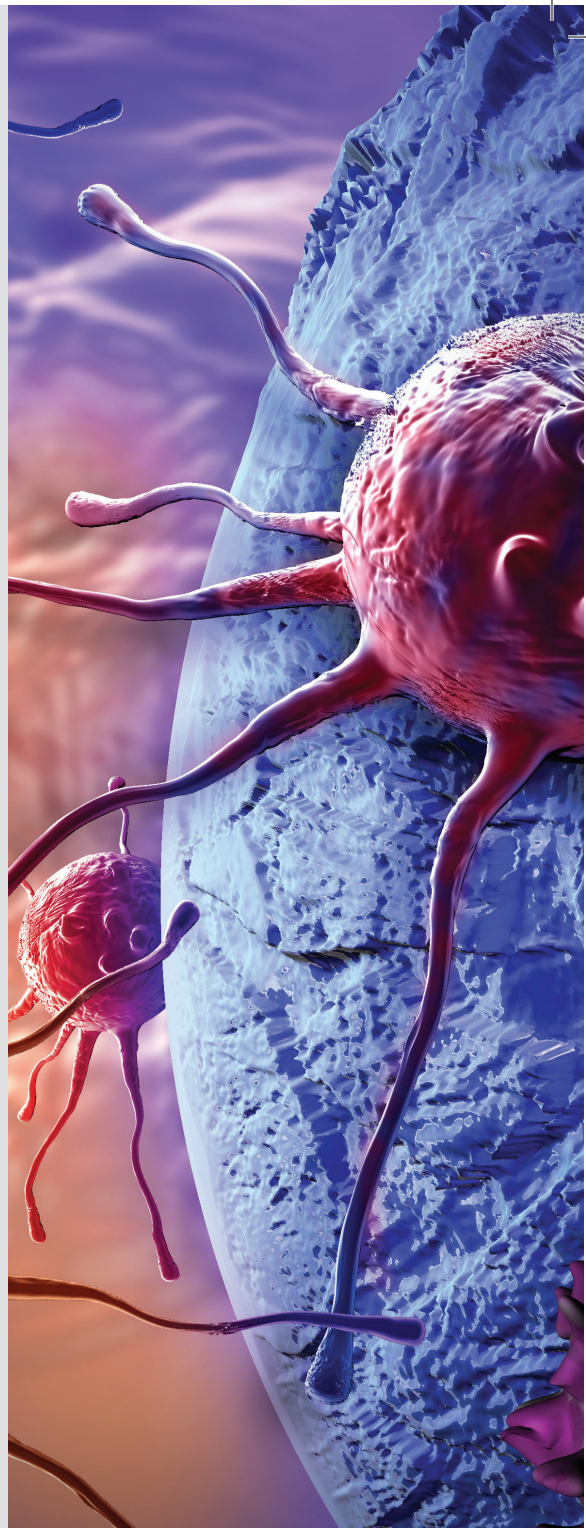
Technology Readiness Level 4-5

Further developments for commercialization and sought expertise from the potential partner

Further developments required taking this technology from TRL 4-5 to TRL 9. The following is the system picture of the device. This project is sponsored by TUBITAK under the 1003 Program with the grant number 113So87.

Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu



ID No: AGZ-o6-COOPoo6

Polymer Electrolyte Membrane (PEM) Fuel Cells

Description

We have been developing membranes and electrode materials for PEM Fuel Cells.

Potential applications

Fuel Cells

Technology Readiness Level 4-5

Further developments for commercialization and sought expertise from the potential partner

We have several TUBITAK funded and EU funded projects in this topic. We have been developing proton-exchange membranes based on polymers for low temperature and high temperature fuel cells.

The membranes can be scaled up and used for different industrial applications. Moreover, we have been developing catalysts and electrodes for PEM fuel The membranes can be scaled up and used for different industrial applications. Moreover, we have been developing catalysts and electrodes for PEM fuel cells based on carbon and graphene. We can prepare fuel cell stacks for applications together with a company.

Contact:

**Industry Collaboration and Technology
Licensing Office** tto@sabanciuniv.edu



ID No: AGZ-07-COOP007

Materials For Li-Ion And Li-Air Batteries

Description

We have been developing electrodes for Li-ion and Li-air batteries.

Potential applications

Li-ion and Li-air batteries

Technology Readiness Level 3-4

Further developments for commercialization and sought expertise from the potential partner

We have projects funded by TUBITAK. We can collaborate with industrial partners or universities to scale up our electrodes for applications.

Contact:

Industry Collaboration and Technology
Licensing Office tto@sabanciuniv.edu





SABANCI UNIVERSITY

Orta Mahalle, Tuzla 34956 Istanbul / Turkey

+90 216 483 90 00 ✉ tto@sabanciuniv.edu 🌐 rgp.sabanciuniv.edu

🌐 www.sabanciuniv.edu