



Invention Portfolio



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ODTÜ

ODTÜ started education on November 15, 1956 in order to contribute to the development of Turkey and the countries in the Middle East, and especially to train people so as to create a skilled workforce in the fields of natural and social sciences.

Today, ODTÜ embodies **5** faculties, running a total of **43** programs in Ankara, Erdemli, and Northern Cyprus Campuses. There are **112 graduate and 75 doctorate** programs available in the Graduate Schools of Natural Sciences, Social Sciences, Informatics, Applied Mathematics and Marine Sciences Graduate Schools. Marine Sciences conducts the academic program studies in Erdemli/Mersin.

Owing to the quality of academic education that emphasizes merit and excellence in scientific, cultural and intellectual studies as well as owing to the accomplished and qualified ODTÜ graduates, the University has become one of the distinguished and respectable institutions of Turkey. Today, the University is proud to employ about **773** faculties, **456** academic instructors and **602** research assistants. It is a great pleasure to offer education to over **28.000** students. The total number of the alumni now is above **131.000**.

ODTÜ TTO

connects academics and industry...

As a result of scientific research carried out by ODTÜ academicians using ODTÜ infrastructure, research outputs and technologies with high social benefit are developed.

These research outputs and technologies draw interest when published in scientific circles but without a company willing to invest in bringing the invention to market; these inventions will never leave the lab and create a public benefit. As ODTÜ TTO, we aim to get these research outcomes into products & services, where they can facilitate millions of people's lives.

ODTÜ TTO has been established as a unit in ODTÜ Teknokent in 2007 and its mission is to be able to bring research innovations to the market with a sustainable technology transfer strategy and to continue its role as a bridge supporting ODTÜ academics and industry.

ODTÜ TTO carries out the application and registration processes and commercialization activities of intellectual and industrial property rights (FSMH) of the results requested by ODTÜ within the scope of Industrial Property Law No. 6769 from the results of research conducted by ODTÜ academicians and students. ODTÜ TTO covers a wide range of activities, starting with FSMH protection, continuing with license agreements and developing different university-industry partnerships.

ODTÜ TTO seeks out members of the industry who are acquainted with researchers' fields to discuss what is most needed and sought after by industry. The TTO team which does due diligence to determine the commercial potentials of research outputs that are independent of or in this process identifies the management strategies of the intellectual property together with the inventors.

Currently, there are more than 150 inventions ranging from biomedical to nanotechnology, physics to industrial engineering and defense. For these inventions, more than 400 patent applications have been submitted and many of them are EPO, USA, Japan, and EAPO applications. More than 200 patents have been registered with 150 international and 55 national grants.

the 1990s, the number of people in the world who are under 15 years of age has increased from 1.1 billion to 1.3 billion. The number of people aged 65 and over has increased from 200 million to 350 million. The number of people aged 75 and over has increased from 50 million to 100 million. The number of people aged 85 and over has increased from 10 million to 20 million.

The number of people aged 65 and over is expected to increase to 500 million by 2025. The number of people aged 75 and over is expected to increase to 150 million by 2025. The number of people aged 85 and over is expected to increase to 40 million by 2025.

The number of people aged 65 and over is expected to increase to 600 million by 2050. The number of people aged 75 and over is expected to increase to 200 million by 2050. The number of people aged 85 and over is expected to increase to 60 million by 2050.

The number of people aged 65 and over is expected to increase to 700 million by 2075. The number of people aged 75 and over is expected to increase to 250 million by 2075. The number of people aged 85 and over is expected to increase to 80 million by 2075.

The number of people aged 65 and over is expected to increase to 800 million by 2100. The number of people aged 75 and over is expected to increase to 300 million by 2100. The number of people aged 85 and over is expected to increase to 100 million by 2100.

The number of people aged 65 and over is expected to increase to 900 million by 2125. The number of people aged 75 and over is expected to increase to 350 million by 2125. The number of people aged 85 and over is expected to increase to 120 million by 2125.

The number of people aged 65 and over is expected to increase to 1 billion by 2150. The number of people aged 75 and over is expected to increase to 400 million by 2150. The number of people aged 85 and over is expected to increase to 140 million by 2150.

The number of people aged 65 and over is expected to increase to 1.1 billion by 2175. The number of people aged 75 and over is expected to increase to 450 million by 2175. The number of people aged 85 and over is expected to increase to 160 million by 2175.

The number of people aged 65 and over is expected to increase to 1.2 billion by 2200. The number of people aged 75 and over is expected to increase to 500 million by 2200. The number of people aged 85 and over is expected to increase to 180 million by 2200.

The number of people aged 65 and over is expected to increase to 1.3 billion by 2225. The number of people aged 75 and over is expected to increase to 550 million by 2225. The number of people aged 85 and over is expected to increase to 200 million by 2225.

The number of people aged 65 and over is expected to increase to 1.4 billion by 2250. The number of people aged 75 and over is expected to increase to 600 million by 2250. The number of people aged 85 and over is expected to increase to 220 million by 2250.

The number of people aged 65 and over is expected to increase to 1.5 billion by 2275. The number of people aged 75 and over is expected to increase to 650 million by 2275. The number of people aged 85 and over is expected to increase to 240 million by 2275.

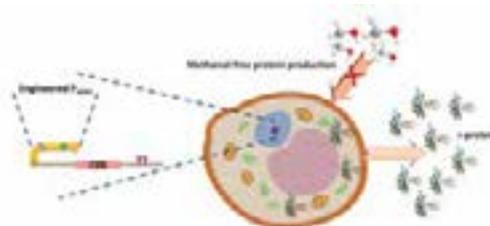
The number of people aged 65 and over is expected to increase to 1.6 billion by 2300. The number of people aged 75 and over is expected to increase to 700 million by 2300. The number of people aged 85 and over is expected to increase to 260 million by 2300.



Medical Technologies



Methanol-based and Methanol-free Production Systems by Enhanced AOX1 Promoter Variants



Modified AOX1 Promoter Variants

This invention provides enhanced AOX1 promoter variants that is stronger than wild-type AOX1 promoter and can be regulated by a safer carbon source and for high-yield r-protein production with *P. pastoris*. Enhanced AOX1 promoter variants can be used for production of any industrially important therapeutic and prophylactic proteins and enzymes.

Advantages

Higher production capacity than already strong native AOX1 promoter

It can be regulated by a safer carbon source, instead of toxic methanol

It can be used for production of therapeutic and prophylactic proteins and any other industrially important proteins

Enhanced AOX1 promoter variants provide efficiently controlled bioprocess operations

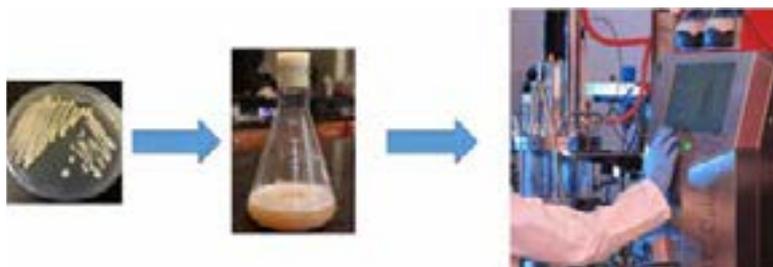
Using a cheap and safe carbon source simplifies production, obtaining high amount of products in a short time

High yield r-protein production

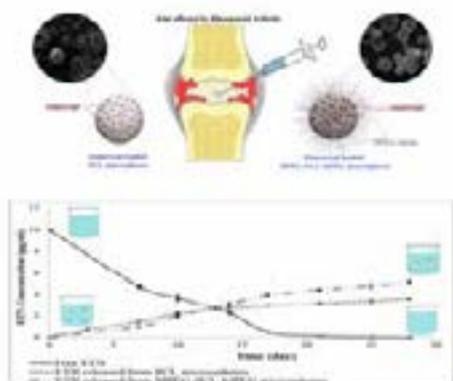
Promoter genes are the most essential genetic tools of recombinant protein (r-protein) production processes. AOX1 promoter is the most widely used promoter of *Pichia pastoris* in industrial biotechnology applications. This invention presents enhanced AOX1 promoter variants which are induced in methanol-free (safer carbon source source) and methanol fermentations and reach higher product yields.

This invention provides a genetic tool to produce any interested therapeutic and prophylactic protein or industrial enzyme where higher yield in a shorter time can be achieved by methanol-free fermentations.

Enhanced AOX1 promoter variants can be used for production of any industrially important therapeutic and prophylactic proteins and enzymes.



Controlled Drug Delivery Systems for Anti-TNF α



Anti-TNF α Loaded Microspheres

Intra-articularly injectable microspheres for anti-TNF α would provide long term controlled drug release with sustained anti-inflammatory effect as a local treatment for rheumatoid arthritis, ankylosing spondylitis, and psoriatic arthritis.

Advantages

Efficiency

Drug level in the articular joints can be maintained at the desired level

Applicability

Size range providing easy injection even into a joint of a small child

Biocompatible

Systemic toxicity and side effects of the drug are no longer a concern

Comfort

Single-shot injections increase the life quality of the patients

Economic

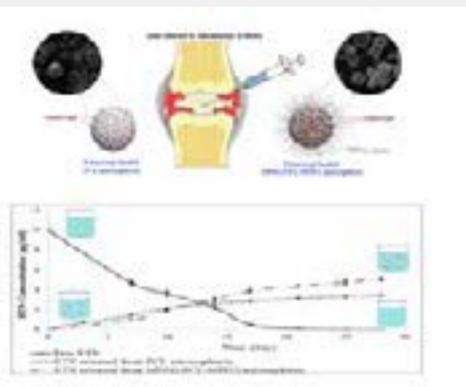
Used drug amount is less than the conventional dose

The effective local treatment with an one-time intra-articular injection

Controlled drug delivery systems for anti-TNF α are needed to improve the potential for clinical use and to reduce the adverse effects arising from the high doses. Also, this drug delivery system would be used as the single drug treatment for the oligoarticular subtype of rheumatoid arthritis and the additional local therapy for the treatment of other subtypes.

Intra-articularly injectable anti-TNF α drug loaded polymeric microcarriers would provide a sustained release of anti-TNF α drug at therapeutic effective doses for more than 3 months for the treatment of juvenile and adult rheumatoid arthritis.

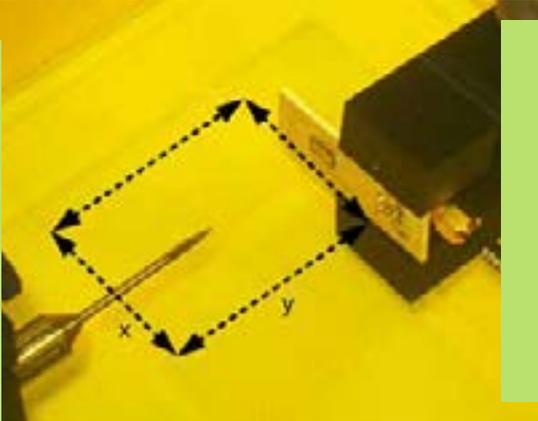
Polymeric microcarriers are produced by using biocompatible and biodegradable poly (α -caprolactone) (PCL) homopolymer or methoxy poly (ethylene glycol) - poly (α -caprolactone) - methoxy poly (ethylene glycol) (MPEG-PCL-MPEG) copolymer.



Diamond Transducer

Diamond Membrane Ultrasonic Transducer

The membrane of the ultrasonic transducer is composed of via microfabrication technology combined with diamond.



Advantages

Robustness

Protected against environmental effects

Thermal Conductivity

Conducts heat quickly

Hardness

Scratch resistant

Corrosion Resistance

Chemically inert

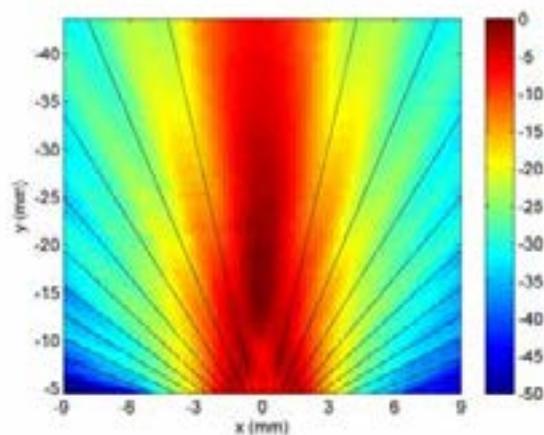
Biocompatibility

Compatible with living structures

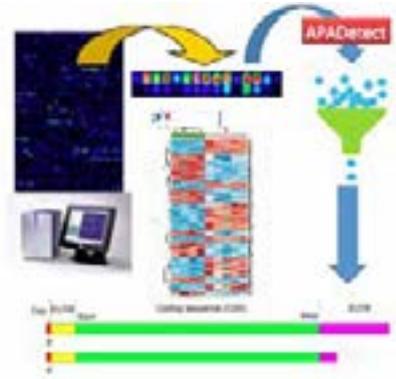
More robust and high potential than conventional devices

This invention presents microfabrication of high performance and robust diamond membrane transducers.

Microfabrication of transducers depend on the plasma-activated molecular wafer bonding technique. In the invention, this method has been applied for diamond membrane ultrasonic transducers. Microfabrication of therapeutic ultrasonic transducers having long lifetime and high potential has been provided.



APADetect: Alternative Polyadenylation Detection



APADetect Extracts UTR Length Changes

Uses existing array data for detecting 3' UTR length alterations which may have huge impact on protein levels.

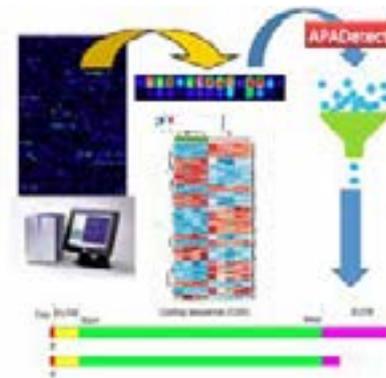
Advantages

- Uses already existing array data
- Can incorporate diverse arrays for analysis
- Can analyze most commonly used human and mouse chips

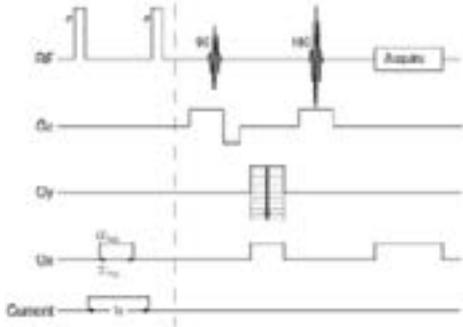
Detection of 3' UTR length alterations

APADetect is a novel gene and biomarker discovery tool for diseases.

Current array tools uses probe means for gene expression quantification. mRNA length changes cannot be identified this way. This invention does the analysis based on probe groups divided by polyadenylation sites, giving the end user the information of UTR shortening or lengthening.



Spin Tagged Magnetic Resonance Current Density and Electrical Impedance Tomography



Spin Tagged Impedance Tomography

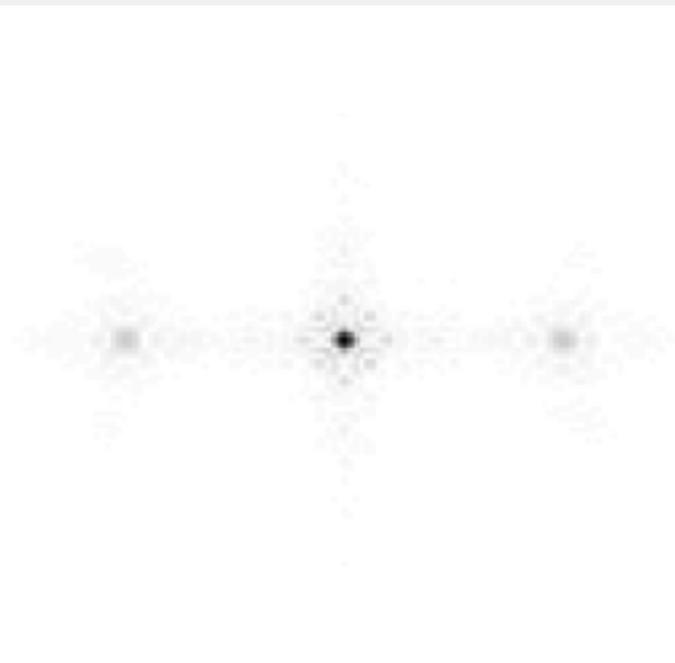
Without requiring spin echo based pulse sequences for MREIT, imaging the magnetic flux density, current density and impedance.

Advantages

- Does not require the usage of spin echo based pulse sequences
- Reduces the image acquisition time
- Increases the practical applicability of MREIT in clinical environment
- Increases the feasibility of imaging the tissues with short T_2 times
- Reduces the total current applied to the patient using single acquisition based pulse sequences

Moving the current injection before the imaging pulse sequence

This invention provides current to be injected into the object alongside with tagging gradient. Current generates a magnetic flux density that acts like a local gradient which alters the tagging gradient. Using the change done on the tagging gradient magnetic flux density distribution can be found. Using this information, current density and impedance distribution will be calculated.



Identification of Novel Disease Genes for Classification Purposes Using APA Signature

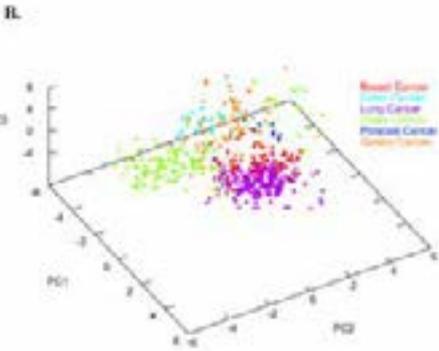
Novel Biomarker Discovery Tool

Alternative polyadenylation (APA) based isoform discovery is used for cancer classification. The developed APA signatures have achieved cancer classification at a much higher accuracy than the existing products in the market.

mRNA 3' UTR isoforms are quantified from high throughput data

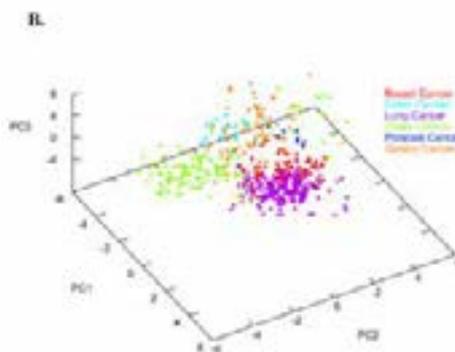
There are areas that need to be developed at various stages of cancer. More effective methods are needed in diagnosing the disease, predicting prognosis and improving treatment options. Gene expression studies produce new information on changes in mRNA levels. There are products that use this information to calculate the prognosis (eg: MammaPrint® 70-Gene Breast Cancer Recurrence Assay-Agendia-, Prosigna™ Breast Cancer Prognostic Gene Signature Assay-Nanostring)

The novelty of the invention is the use of the knowledge of the 3'UTR isoform diversity which is not used in any of these assays. With the classification power generated by the invention, it is possible to diagnose cancer by non-invasive methods.



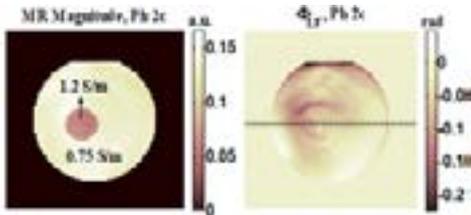
Advantages

- High accuracy
- Fast result
- Early diagnosis
- Economic method



PCA analysis of correct classification of common cancer types

Induced Current Magnetic Resonance Electrical Impedance Tomography (ICMREIT) Pulse Sequence Based on Monopolar Slice Selective Gradient Pulses



Induced MR Impedance Tomography

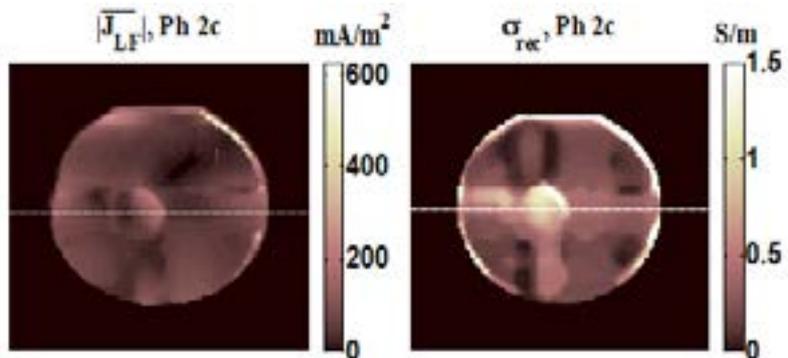
ICMREIT is realized with an optimized approach by using selective 180° RF pulses and a monopolar slice selective gradient waveform.

Advantages

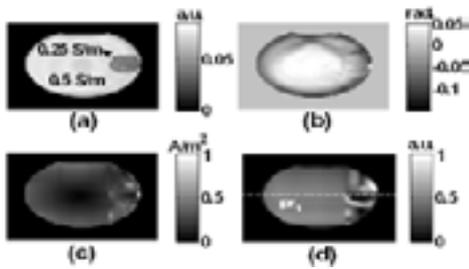
- Realization of ICMREIT with slice selection gradient coils
- Realization of ICMREIT using spins in the selected slice
- Optimized realization of ICMREIT with monopolar excitation
- Realization of ICMREIT by minimizing RF and gradient artifacts
- Realization of ICMREIT without the need of additional equipment

Optimized realization of ICMREIT using slice selection gradient

With the technology developed by the invention, slice selection gradient coil is excited with monopolar current which induces eddy current in the object being imaged. 180° RF pulses in synchrony with the gradient waveform induces eddy current related phase in MR images. Using the MR phase images, current density and conductivity images are reconstructed.



Induced Current Magnetic Resonance Electrical Impedance Tomography (ICMREIT) Pulse Sequence Based on Bipolar Gradient Pulses



Induced Current Impedance Tomography

ICMREIT is realized by using the readily available gradient coils of magnetic resonance imaging (MRI) scanners without the need of additional equipment.

Advantages

Realization of ICMREIT with gradient coils of MRI scanners

Realization of ICMREIT without the need of additional equipment

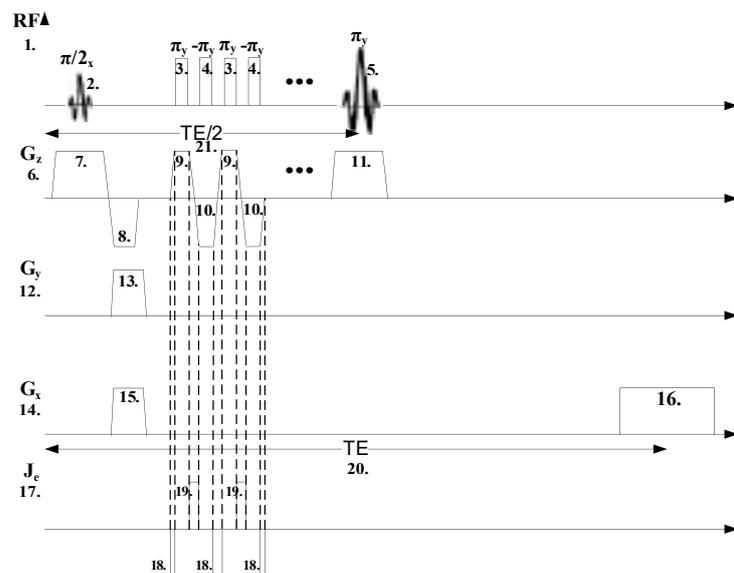
Contactless induction of eddy current in the body

Overcoming application difficulties of classical MREIT due to electrodes

A remedy for imaging tissues with high impedance

Realization of ICMREIT with MRI gradient coils

Gradient coils are excited with time varying electrical current which induces eddy current in the object to be imaged. The secondary magnetic field created by the eddy current accumulates phase in MR images. Using the secondary magnetic field measurements, current density and conductivity images could be reconstructed.



An Energy Harvesting Cochlear Implant

Next Generation Cochlear Implants

The proposed implant can be fully implanted in the skull and can generate its own power. It mimics the natural hearing mechanism of the ear and hence eliminates battery and aesthetic concerns of the patients.

A self-powered cochlear implant

Hearing impaired patients can be treated with cochlear implants. These cochlear implants consist of a sound processor mounted to outer ear, implant that is surgically placed inside skull, and electrode that stimulates related auditory nerves inside the cochlea. This system, requires daily replacement of battery which prevents patients' continuous access to sound and brings aesthetic problems to patients.

This invention is capable of converting vibrations of eardrum of specific frequency to electrical signals and stimulate the auditory nerves with the generated signals. Hence, the need for the sound processors and the implant components that is used in commercialized cochlear implants can be eliminated. In addition, the battery need of the system can be removed since the energy required for the system to run is generated by simply converting the available kinetic energy of the vibrations of the eardrum to electrical energy. Moreover, aesthetic issues of the patients can be disregarded since the system is totally implantable.

Advantages

Low-Cost

MEMS fabrication reduces cost

Fully Implantable

All the components of the proposed system can be implanted in the body eliminating aesthetic concerns

Autonomous Operation

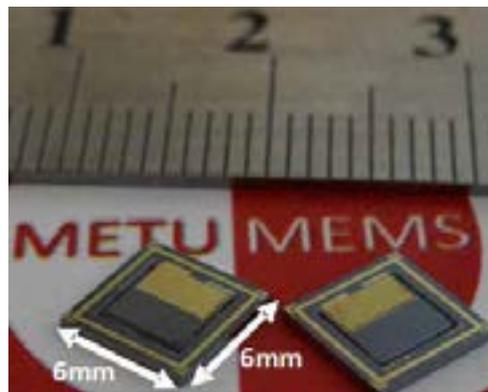
The system can generate its own energy from acoustic signals

Better Quality

As the systems mimics the natural hearing mechanism, it provides better hearing quality

Simpler Structure

The system eliminates some of the components, like microphone, RF transmitter and microprocessor, occupying significant space in conventional systems



A Microfluidic-Channel Embeddable, Laterally Oscillating Gravimetric Sensor Device Fabricated with MEMS Technology

On-Chip Cancer Cell Detection

The invention is a lab-on-a-chip system for cancer detection at early stage. It presents a mechanical gravimetric sensor embedded in a microfluidic channel for fast and efficient counting of cancer cells from similar size cells.

Fast and efficient counting of cancer cells

The industry needs disposable lab-on-a-chip systems for fast and effective separation and counting of cancer cells from the other cells in blood.

The invention represents a laterally oscillating gravimetric sensing device embeddable under micro-fluidic channels and fabricated with micro-electro-mechanical systems (MEMS) technology, which detects biological cells and analytes by measuring the change of mass attached on its surface.

Advantages

Low-Cost

MEMS fabrication reduces cost

More Than One Type of Cancer Cell Detection

Microfluidic implementation allows simultaneous detection of various cancer cells

Portable

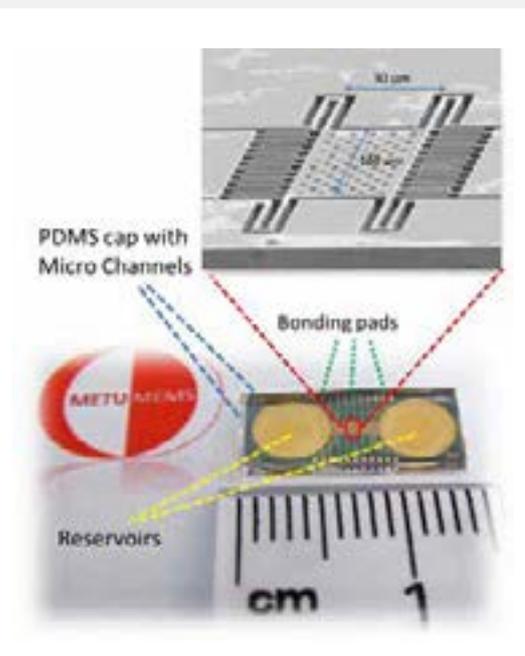
integrated microfluidics approach provides portability of the whole detection system

Fast Detection

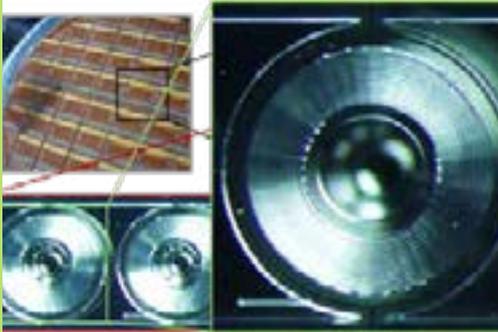
The device can separate and detect cancer cells much faster than the conventional counterparts

Wide Applicability

Same device concept can be used to for other particles where separation is necessary, contraction-extension, or rotation



Dielectrophoretic Cell Chromatography Device with Spiral Microfluidic Channels and Concentric Electrodes, Fabricated with MEMS Technology



On-Chip Cancer Cell Detection

The invention is a lab-on-a-chip system for cancer detection at early stage. It allows cancer cell separation from other cells in similar dimensions.

Advantages

Low-Cost

MEMS fabrication reduces cost

More Than One Type of Cancer Cell Detection

Microfluidic implementation allows simultaneous detection of various cancer cells

Portable

integrated microfluidics approach provides portability of the whole detection system

Fast Detection

The device can separate and detect cancer cells much faster than the conventional counterparts

Wide Applicability

Same device concept can be used to for other particles where particle electrical properties can be utilized for separation

Separation of cancer cells from similar size cells via dielectrophoresis system embedded in a microfluidic channel

The industry needs disposable lab-on-a-chip systems for fast and effective separation of cancer cells from the other cells in blood.

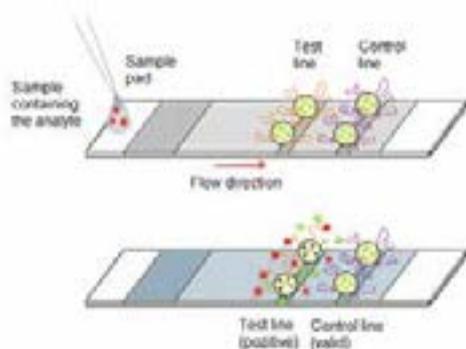
This invention relates to a chromatography device of which intended purpose is biological cell separation, performing dielectrophoresis by concentric electrodes and spiral microfluidic channels produced by micro electromechanical system (MEMS) technology.



Aptamer-Gated Nanoparticles for Lateral Flow Assays

Intelligent Nanoparticles for Point of Care Diagnosis

This invention focuses on a new technology for the development of lateral flow assays. This technology is based on the principle, where aptamer-gated silica nanoparticles produce a visible signal if the target molecule is present. It is a new technology providing low limit diagnosis for lateral flow assay test strips.



Advantages

Useful

The specialty to be used in lateral flow assay strips

Visible

Signal formats visible by unaided eye or by fluorescence

Efficient

The potential to reach lower limits of detection compared to classical lateral flow assay strips

High Performance

The potential to be employment in the detection of smaller molecules

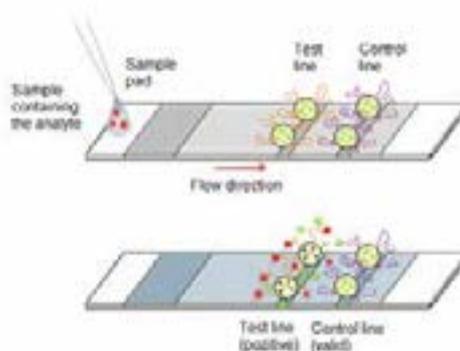
Sensitive

Higher sensitivity

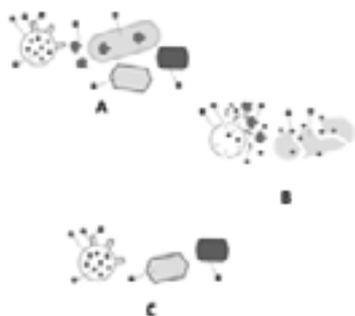
Mobile, fast, on-site, cheap and reliable diagnosis platforms

Lateral flow assays are based on the appearance of a visible signal (a red line) due to the capturing of the target molecule bound by gold nanoparticle conjugated antibodies. The most important problem with such platforms is the relatively higher limits of detection compared to other methods, i.e. lateral flow assays can be used when the target molecule is at a certain concentration.

This invention defines a new visible signal system without using gold nanoparticles in the lateral flow test strips, with which the limit of detection of such test systems can be lowered. It is an employment of aptamer-gated silica nanoparticles in testing platforms.



Applications and Tools Based on Silica Particles Coated with Biological or Synthetic Molecules



Intelligent Nano Cargo Delivery Systems

The invention focuses on porous silica nanoparticles, of which pores are loaded with biologically active molecules and further closed with biological or synthetic molecules, which, upon interaction with specific target molecules release the cargo.

Advantages

High selectivity and specificity of the cargo release

Robustness provided by mesoporous silica spheres

Multipurpose usage gained by varying the cargo and the gating molecule

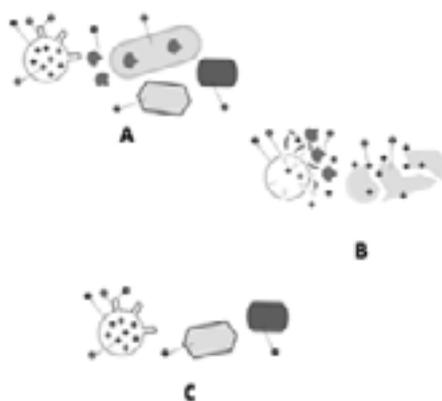
Nontoxicity of the silica spheres for application in living organisms

Possibility of adapting the invention to other similar systems and apparatus

Nano-sized carriers for intelligent cargo delivery

Targeted delivery systems are being vastly employed in many fields, ranging from health to textiles. Current systems are based on either organic or inorganic carriers with poor biological specificity. Therefore, they either leak their Cargo or release their Cargo upon encounter with nonspecific molecules.

This invention defines a new approach by immobilizing the Cargo within mesoporous silica spheres of micro or nano-size and coating their surface with biologically active molecules in order to prevent leakage and nonspecific release. This invention has a vast application potential ranging from diagnostic systems to smart bio-textiles.



Biodegradable Bone Fillers, Membranes and Scaffolds Containing Composite Particles



Fast Healing in Bone Wounds

The innovation is about the production of a composite tissue scaffold containing antibiotic to prevent infection and calcium phosphate to enhance bone healing.

Advantages

Support

Support to bone by filling the defects

Regeneration

Enhancing the tissue regeneration

Variety

Can be prepared in powder, film and bulk forms

Antibacterial

Has infection preventing property

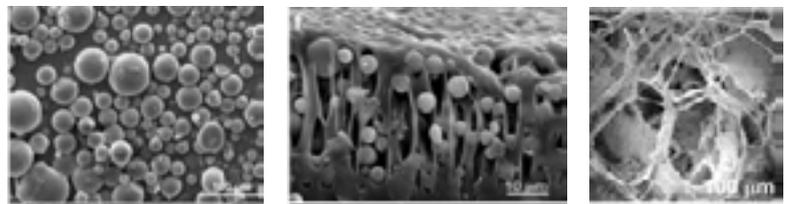
Fast

Heals the difficult bone defects effectively

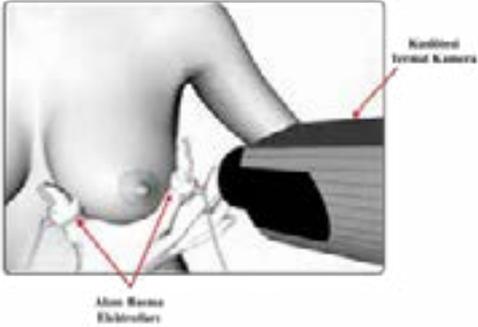
Heals the bone wounds and prevents microbial infection

This invention is related to bone fillers, hard tissue supporting films and three dimensional scaffolds that contains composite particle of inorganic compound/water soluble polymer (such as β -TCP/Gelatin), that can lead to bone regeneration and release an antibacterial or bioactive agent at the defect area.

The bone regenerative hard tissue supporting films and scaffolds were obtained by addition of antibacterial or bioactive agent loaded composite particles into biodegradable polymer.



Multi-Frequency Current Applied Dual-Band Active Thermal Imaging and the System Thereof



Medical Electro-Thermal Imaging

The technique while increasing the thermal contrast provides frequency dependent conductivity distribution data which can be used as a basis for the detection of the breast carcinoma.

Advantages

Reliable

Generates thermograms with improved thermal contrast

Harmless

Does not involve ionizing radiation and no harmful effect on the human body

Painless

No breast squeezing required

Early Stage Detection

Early stage diagnosis of breast carcinoma for deeply located tumors

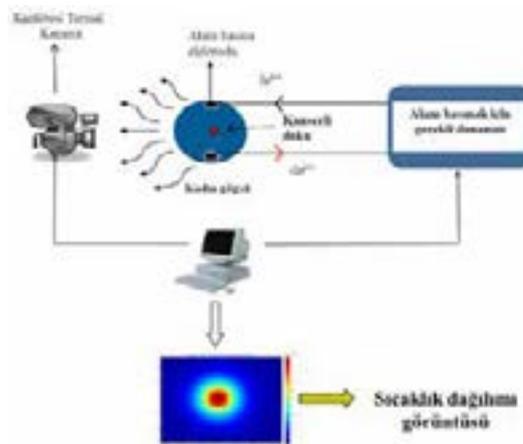
Screening Usage

Low-cost, portable and fast screening time; can be used as a real-time imaging modality

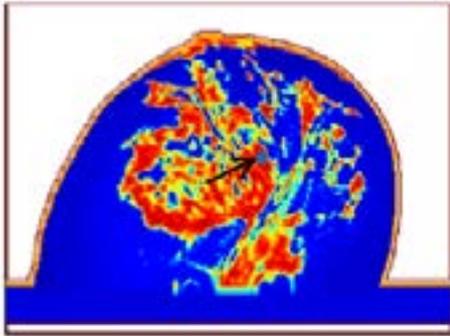
An hybrid imaging method using electrical and thermal imaging methods

Mammography is the standard test for breast screening. However, it can give false positive and false negative results. Utilization of ionizing radiation and pain related to squeezing of breast are also disadvantages of this method. Since there is no gold standard in breast screening, novel methods are required to detect cancerous tissue in the breast.

The temperature distribution inside the body due to internal (metabolic heat generation, blood perfusion) and external sources (electrical currents) is imaged in this invention. More reliable images of the examining area can be obtained using three physical properties of the tissue, i.e., thermal properties, emissivity property and electrical properties.



Harmonic Motion Microwave Doppler Imaging



Breast Tumor Imaging Method

Enables non-invasive and painless detection of tumors hidden in the dense breast tissue using their dielectric and elastic properties.

Advantages

Reliable

Tumors in dense (glandular) tissues can be detected

Harmless

The does not involve ionizing radiation

Painless

No breast squeezing required

Early Stage Detection

Millimetric sized tumors can be detected

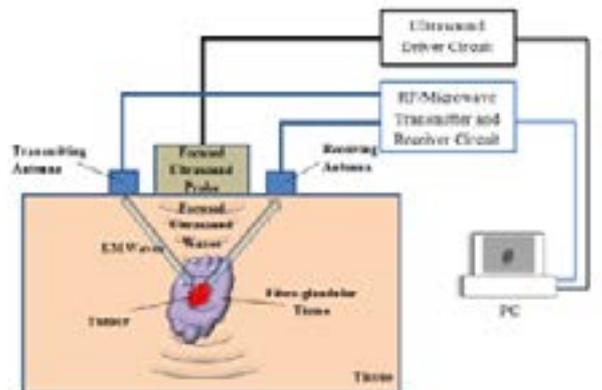
Screening Usage

Being harmless and low-cost, screening of breast cancer is possible

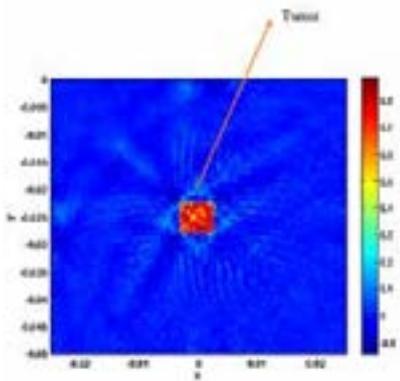
Detection of breast cancer in early stage

Clinically used method for breast tumor detection, mammography, can give false positive and false negative results. Utilization of ionizing radiation and pain related to squeezing of breast are also disadvantages of this method. Therefore, novel methods are required in order to eliminate the disadvantages of mammography.

The method developed makes use of high resolution and radiation force of ultrasound and penetration property of electromagnetic waves. A millimetric volume is vibrated which is also illuminated with microwaves. The received signal depends on the elastic and dielectric properties enabling tumor discrimination.



Multifrequency Electrical Impedance Imaging Using Lorentz Fields



A Novel Imaging Technique to Detect Cancerous Tissues

It is a hybrid method to image the electrical impedance imaging (electromagnetic fields and ultrasound) High-resolution, early stage diagnosis of tumor tissues are possible with this method.

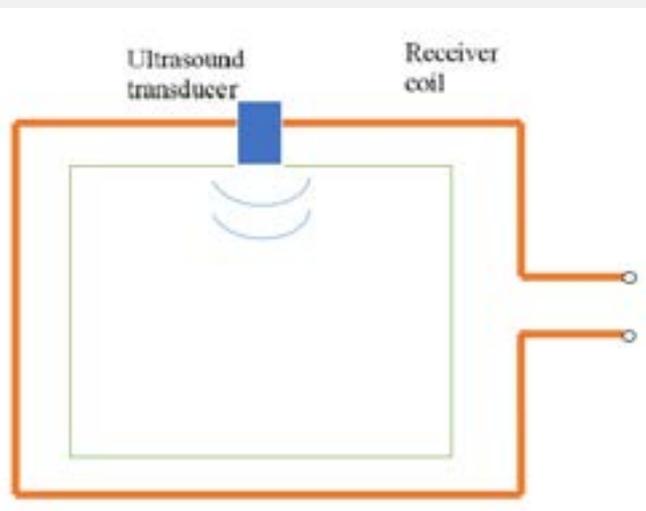
Advantages

- High resolution
- Early stage diagnosis
- Information from deeper tissues
- Contactless measurements
- Fast, safe, and comfortable imaging

Imaging method to detect the tumor tissue at early stage

The approach is based on electrical current induction using ultrasound together with an applied static magnetic field. Acoustic vibrations are generated via piezoelectric transducers located on the surface of a biological body.

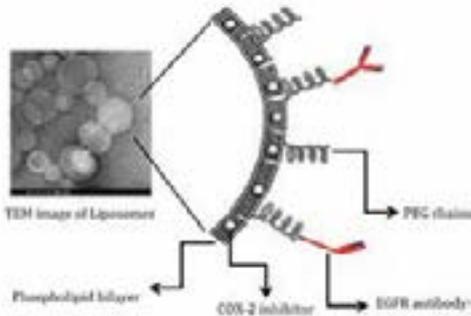
In the existence of a static magnetic field, the resultant (velocity) current density is sensed by a receiver coil encircling the tissue or placed near the tissue and used for reconstructing the conductivity distribution.



LIPOXIB

Targeting Cancer with Nano-Liposomes

It is a novel formulation for the targeted delivery of Celecoxib in liposomes with EGFR antibodies for specific targeting and rapid internalization in cancer cells overexpressing EGFR.



Advantages

Nano-Sized

Not eliminated by the immune system

Long Circulating

PEG chains ensure prolonged circulation time

Biocompatible

Made from non-toxic biomaterials

Less Side Effects

Overcomes systemic side effects of celecoxib

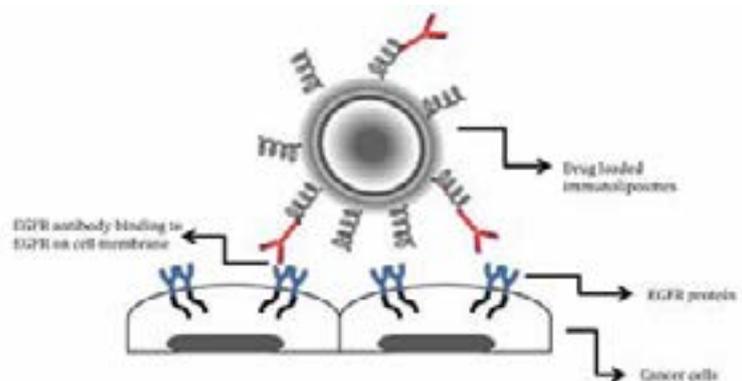
Targeting Cancer

EGFR antibody ensures uptake by cancer cells while sparing normal cells

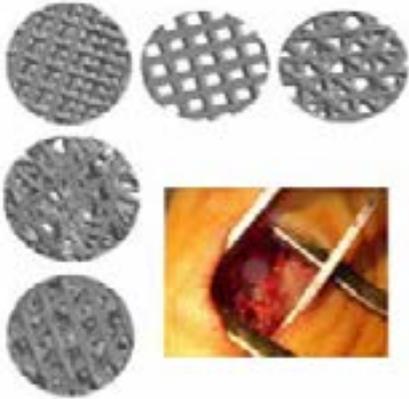
Overcomes cardiovascular side-effects of systemic delivery of celecoxib

Targeted cancer therapies are designed to spare normal cells while killing cancer cells, thereby limiting the side-effects of traditional chemotherapy. Solid tumors frequently overexpress EGFR. This novel liposomal formulation is designed to deliver celecoxib directly to cancer cells which overexpress EGFR, providing a non-toxic biocompatible platform for targeted drug delivery.

The invention consists of nanosized liposomes made from 1,2-Distearoyl-sn-glycero-3-phosphocholine (DSPC) and polyethylene glycol (PEG) by extrusion. Celecoxib is encapsulated in the lipid bilayer. The F'ab fragments of EGFR antibody are covalently conjugated to the maleimide termini of the PEG chains.



Biodegradable and Bioactive Material Development for Craniofacial Bone Defects, and Production in two Methods



Implant and Its Production via Rapid Prototyping & Lyophilization

Never requires a second surgery for hardware removal.

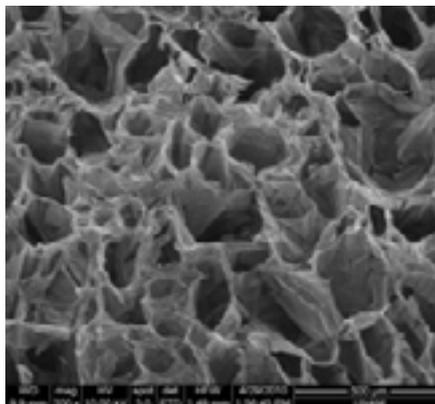
Advantages

- Melting in the body
- Porous
- Biodegradable
- Leaving the place to new developing tissue
- There is an antibiotic
- Has a growth factor
- No revision surgery required

Growth factor will be used as a component for the first time and it will help tissues to heal faster

The proposed craniofacial devices will be bioresorbable, and therefore, will not require a second surgery for their removal and avoid the pain, risk of infection and the associated costs observed with the current, nondegradable implants. This invention will also prevent the need for replacement of the implant when the child patient grows. Unlike the current implants it will be porous to allow tissue ingrowth and therefore, healing will be faster.

The currently available craniofacial implants cannot carry antibiotics or growth factors unless coated with a polymer whereas these bioactive agents will be incorporated in the proposed implant itself and will be gradually released as a drug delivery system in unison with the degradation rate of the polymeric implant.



A New Material Developed for Use in Cervical and Lumbar Disc Therapy



Implant Capable of Fusion with the Tissue

The present invention relates to an artificial fusion implant to be placed into the intervertebral space left after the removal of a damaged spinal disc.

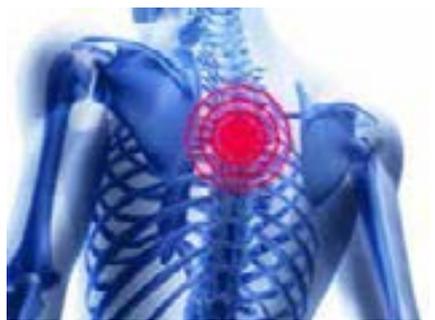
Advantages

- Capable of fusion with the tissue - HAp
- Antimicrobial
- Growth and recovery accelerator
- Has drug delivery systems
- High visibility on X-Ray
- Domestic production, cheap

The invention develops an implant which eliminates the disadvantages of cage-shaped disc prosthesis

In this invention; a PMMA composite is developed using calcium phosphate based and zeolite materials to increase cell attachment, because they are presented at the surface of the implant especially at the beginning and they also impart the ability to carry load. Addition of zeolite enhances the implant mechanically. Bone growth factors such as BMP 2, BMP 4, BMP 7, IGF and EGF can be incorporated into the implant for improved bone tissue formation. In order to prevent post-operational infection, antibiotics can be added into the implant.

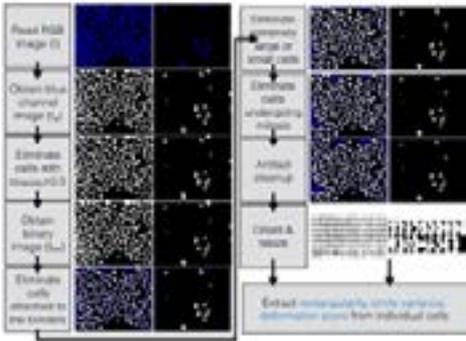
Loading of the antibiotics and growth factors to zeolite and calcium phosphate particles achieve controlled release of bioactive agents from zeolites starting from the outer surface of the implant gradually moving towards inside. Moreover, the ability of the semi-opaque nature of zeolite to partially transmit x-ray enables the observation of the location of the implant.



A Nano/Micropatterned Cellular Nucleus Deformation Based Cancer Diagnostic System

Micropattern Induced Nuclear Deformation for Diagnosis (MINDD)

This diagnosis system is based on a simple physical surface design which is able to discriminate healthy and cancerous cells without use of any chemicals or expensive equipment.



Advantages

Easy

The application is easy and needs no expertise to operate

Accessible

The target consumer group is small hospitals and primary care physicians

Fast

Takes 4-24 hours to get the result

Mobility

Has the potential to be converted into mobile form coupled with an intelligent phone

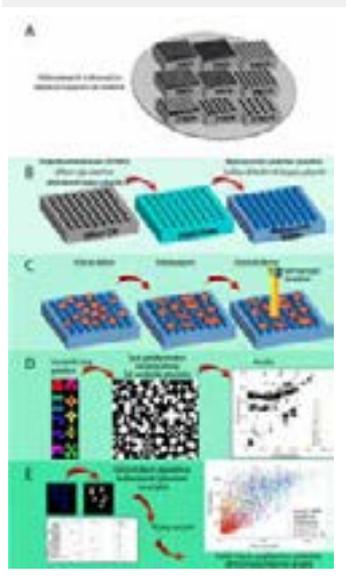
Affordable

Plastic chip and polymer substrate allows low cost production of the detection chips

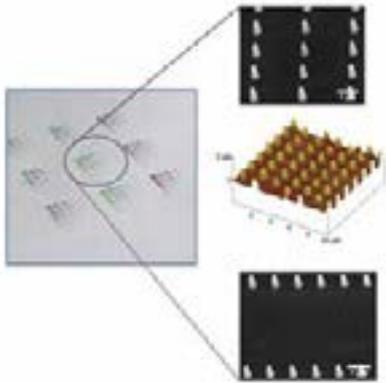
Mobile, simple, fast, on-site, and cheap cancer diagnosis platform

The invention is about a cellular diagnostic system which is composed of micro/nano patterned surfaces that can be integrated into a microfluidics device which reveals the nuclear shape deformability of the cells; which can be imaged with the help of an optical system and can be quantified with a software algorithm.

In this system, nano/micropatterned polymer surface leads to nuclear deformation of cells due to the following factors and it enables a non-expert to discriminate cancerous and healthy cells using an algorithm developed.



A Grid Containing Systematically Distributed Micronanopillar Coated Fields to Control Cell Adhesion



Surveyor or Selective Cell Adhesion Chip

Control over cell adhesion and alignment through surface nano/microtopography, attachment and alignment of different cell types in predetermined fields are possible with the invention.

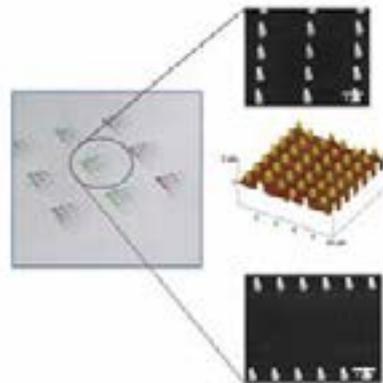
Advantages

- A single test surface for multiple analysis
- Optimisation of implant surfaces
- Prevention of biofouling
- Creation of cell adhesive and repellent fields decorated with hierarchically arranged nanopillars

A grid of hierarchically patterned surface topographies

The grid with systematically varied nano pillar based topographies to determine cell specific dimensions to prevent or promote adhesion and/or alignment of cells are the basic features of this invention.

This approach can be used in connection with producing surfaces for implantable devices, biosensors, and cell sorting/high throughput analysis units.



Stacked, Patterned Biomaterials and/or Tissue Engineering Scaffolds



Complex Tissues Via Simple Design

It is an approach to 3D multilamellar constructs carrying user specific micro- or nano- scale surface features to obtain optimum biomaterial performance or cell behavior.

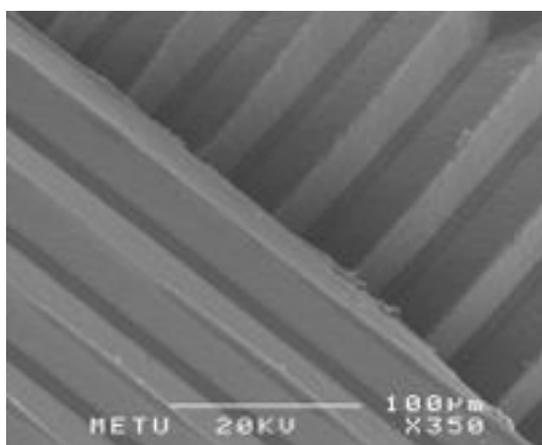
Advantages

- Tailor-made 3D scaffold
- Mimick of different complex organizations.
- Carriage of different cell types
- Flexibility in the size of the artificial tissue.
- Automated production with a robotic system

Capability to make different tissues with complex organizations

As an alternative to organ transplants to substitute damaged tissues, tissue engineering provides scaffolds carrying appropriate cells. In the body these are degraded and remodeled, leading to healed tissues. This invention facilitates making highly organized complex scaffolds carrying more than one cell type to mimic the complexity of different natural tissues.

The methods used involve techniques tailored to develop 3D structures via stacking of discrete microscale layers of both natural and synthetic polymers. The layer-by-layer nature of the process provides the end user with the ability to control the surface features of each layer at nanoscale.



Waist Perimeter Measuring Device and Method



Fast and Accurate Waist Perimeter Measuring via an Inexpensive System

The improved invention provides a fast and accurate measurement of the patient's waist perimeter with a low-cost setup.

Advantages

Practical

Subject just stands still; sensor rotates automatically and system measures the perimeter using the sensed data

Inexpensive

Required sensor and the processing unit of Raspberry can be obtained with moderate prices

Accurate

Thanks to noise reduction method and the symmetry information leveraged, the waist perimeter can be measured up to 2 cm deviation

Measures the waist perimeter quickly and accurately

By converting the time of flight of ultrasonic waves from the source to the subject's waist area into depth information via ultrasonic sensor, 3D position using polar coordinates are calculated. Then these points with a half 180 degree tour around the subject are sampled, and extrapolated automatically to a full turn of 360 degree using the symmetric structure of the waist.

As sensor information involves noise, the sensed data with a smoothing algorithm is also regularized.



Near-Infrared (NIR) Absorbing/ Red-Absorbing Photosensitizers



This invention focuses on a creating and validating a series of advanced PDT agents having absorption in NIR region (>700 nm).

These sensitizers will be decorated with known and novel handles towards specific targeting for various cancer types. This new generation PDT agents provides targeted cancer therapies.

Non-toxic, water-soluble and photostable PDT agents for selective, effective, non-invasive alternative to current treatments.

Advantages

Targeted: The functionalized PDT agents with known and novel handles will activatable and specific to various cancer types.

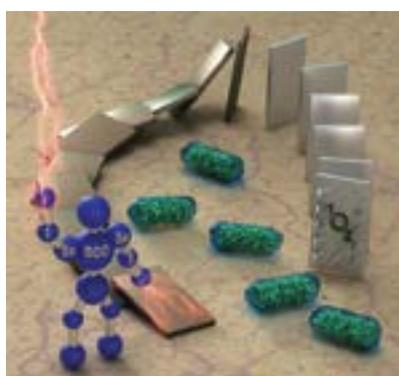
Deep tissue penetration: Having PDT agents with NIR absorption, deep tissue penetration will be achieved.

Efficient: High singlet oxygen generation efficiencies.

Selective: Activation only in cancer cells upon light radiation at wavelengths suitable for deep penetration.

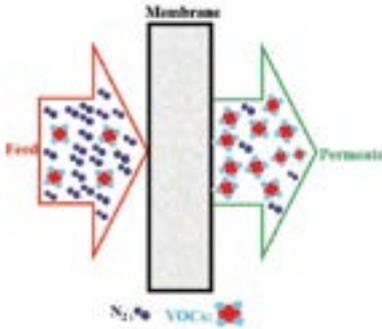
Minimum side effects: Activable PDT agents are non-toxic at dark and upon light irradiation minimum side effects will be achieved on surrounding normal tissue.

Photodynamic therapy (PDT) is an effective treatment modality for various cancer types and has attained elevated attention during the last decade as it is minimally invasive and has fewer side effects compared to current state of the art therapies. In PDT, a photosensitizer (PS) is administered to the patient, followed by its activation by light, which triggers singlet oxygen (1O_2) generation and eventually cell death. However, broader acceptance of PDT in clinical practices is mainly restricted due to the limited penetration of the light that needs to trigger 1O_2 generation through human tissue and lack of cancer cell selectivity. The holy grail in PDT is the realization of non-toxic, water-soluble near infrared (NIR) absorbing PSs with high 1O_2 generation efficiency and effective targeting to tumor cells. It is well documented that NIR light has better tissue penetration due to the lack of auto-fluorescence and minimum interference from bio molecules.



Most of the photosensitizers known cannot satisfy all the requirements of an "ideal PSs", such non-toxicity at dark, high selectivity towards malignant tissue through a targeted approach, activation only in cancer cells upon light irradiation at wavelengths suitable for deep penetration and presence of minimum side effects on surrounding normal tissue. The ultimate goal of this inventions is to offer targeted, activable PDT agents adoptable to various cancer types.

Designing of Alcohol Dehydrogenase 2 (ADH2) Promoter Variants by Promoter Engineering



Hybrid-Architected ADH2 Promoter Variants Induced by Ethanol

This invention presents engineered ADH2 promoter variants for *P. pastoris* cell-factory design

Advantages

High performance protein production platforms:

Engineered ADH2 promoter variants enhance the gene expression consequently the production compared with the naturally occurring strong ADH2 promoter;

Fermentation of ethanol: Engineered ADH2 promoter variants are regulated by the non-toxic carbon source ethanol instead of the toxic methanol, in *P. pastoris*;

Modular: Engineered ADH2 promoter variants can be used for production of therapeutic proteins, prophylactic proteins, enzymes, peptides, and vaccines;

Enables well-designed bioreactor system control: Engineered ADH2 promoter variants are regulated (inducible) promoters and provide efficiently controlled fermentation operations by controlling bioreactor operation conditions;

Low cost production: Utilization of the cheap and non-toxic carbon source ethanol simplifies the production process and downstream purification that reduces the plant investment and operation costs; in contrast, increases the production and productivity.

Enhanced recombinant protein production

Industrial recombinant protein production is performed by construction of a recombinant host cell by integration of the designed genetic circuits; and development of bioprocess operation strategies within the predetermined boundaries of the production domain for the recombinant microorganism.

Promoter genes are the most crucial genetic tools for the construction of recombinant microorganisms since promoters regulate recombinant protein production condition, quantity and production window within the time span of fermentation. The strong and tightly regulated PAOX1 is the most widely used promoter of *P. pastoris* for recombinant protein production. However, toxic-methanol creates risks in the production plants and also requires more intensive downstream purification processes and harder risk assessment and regulatory documentation steps to use the protein in the pharmaceutical and food industries. *P. pastoris* PADH2 is regulated by the non-toxic-carbon source ethanol and its productivity is on a par with PAOX1. *P. pastoris* has gained popularity for industrial recombinant protein production and this invention provides engineered ADH2 promoter variants that is stronger than wild-type PADH2 and PAOX1 promoters and can be used for the construction of recombinant protein production platforms for enhanced recombinant production, regulated by ethanol. Engineered ADH2 promoter variants can be used for production of industrially important therapeutic proteins, prophylactic proteins, enzymes, peptides, and vaccines.



The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial data. This includes not only sales and purchases but also expenses and income. The text suggests that a consistent and thorough record-keeping system is essential for identifying trends and making informed decisions.

In the second section, the author explores various methods for organizing and analyzing financial data. It highlights the benefits of using spreadsheets and accounting software to streamline the process. The text also touches upon the importance of regular reviews and audits to catch any discrepancies early on.

The third part of the document focuses on budgeting and financial planning. It provides practical advice on how to set realistic goals and allocate resources effectively. The author stresses that a well-defined budget can help in controlling costs and maximizing profits.

Finally, the document concludes with a summary of key points and a call to action. It encourages readers to take the time to review their financial records regularly and to seek professional advice when needed. The overall message is one of diligence and transparency in financial management.



Material and Chemistry

Benzotriazole Containing Donor-Acceptor Polymer as a Multipurpose Material

Synthesis of a Multi Colored Polymer

The invented material provides to observe all colors necessary for display technologies in a very small potential range.

Advantages

Donor acceptor type conducting polymer

Soluble in many organic solvents

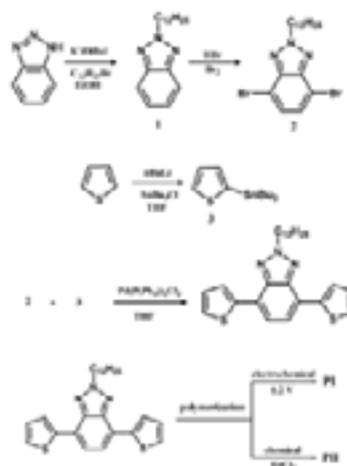
Wide application area (LEDs, solar cells, etc.)

P and N-dopable

The resulting polymer has six distinct colors

This invention is about a material which provides to observe all colors necessary for display technologies in a very small potential range. The material is a derivative of benzotriazole containing donor acceptor type conducting polymer which is soluble, fluorescent and can be used in LEDs, solar cells, electrochromic devices, smart windows and many other technologies.

Development of a conducting polymer which enables the transition between all colors especially red, green, blue, black and transparent colors required in display systems, which is soluble in many different organic solvents, which is both p and n-dopable, which emits light & which is applicable on both LEDs and the active surface of solar cells are aimed.



A New Industrially Viable Method for the Production of Polycarbynes, Polymeric Precursors to Diamond and Diamond Like Ceramics

Artificial Diamond for Industrial Purposes

This invention is a technology which can produce artificial diamond, one of the hardest and durable materials in the world, with a few batteries and salt.

The synthetic diamond from the special polymer via an electrochemical method

Although artificial diamonds are used extensively in the industry, they are difficult to be produced and processed with the existing methods, and the cost is high. This invention produces artificial diamonds using simple electrolysis instead of dangerous and costly chemicals, and ensures that the required surfaces are coated in a diamond film.

Advantages

- Can be coated on a film surface
- Scratch and chemical resistant
- Low cost
- Easy production



Unique Processable Green Polymer with a Transmissive Oxidized State for Realization of Commercial RGB Based Electrochromic Device Applications



Synthesis of First Processable Green Polymer

The present invention highlights the synthesis of first processable green polymer with a transmissive oxidized state. Hence this material is the paramount candidate for the completion of RGB color space through commercial polymeric electrochromics.

Advantages

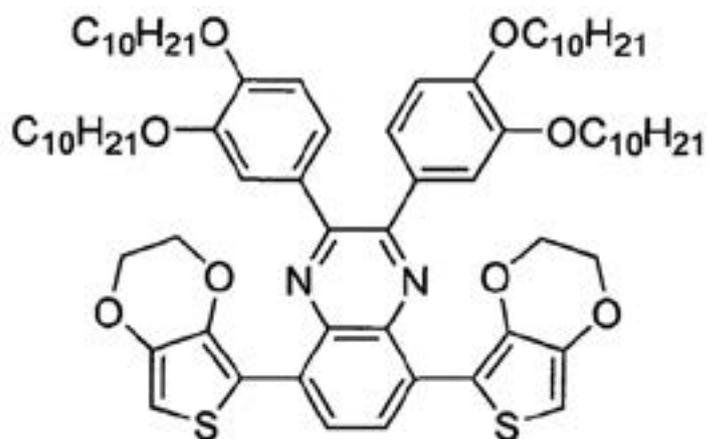
Synthesis of the first green polymer

Superior optical contrast

Excellent switching properties

Construction of display devices using RGB colored polymers

Development of the syntheses of first processable green polymer with highly transmissive colorless oxidized state with higher optical contrasts and excellent switching properties, obtaining the polymer revealed superior optical contrast in the visible region with fast switching times and high stability and obtaining the paramount candidate material for completion of RGB color space are aimed with this invention.



Production of Tungsten and Tungsten Alloys from Tungsten Bearing Compounds by Electrochemical Methods

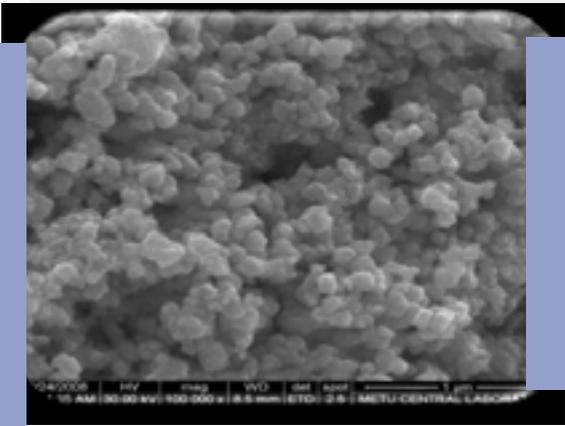
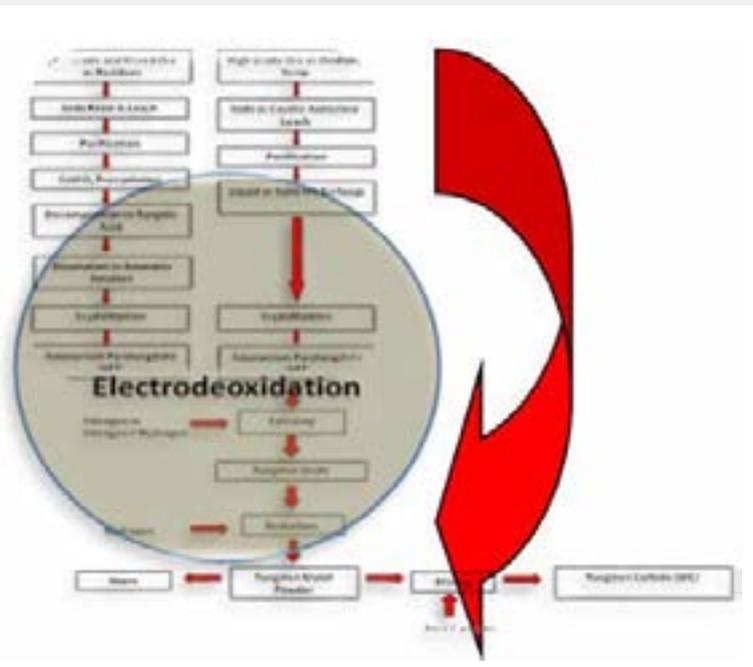
From Scheelite to Tungsten

This invention is an alternative tungsten production technique. It is convenient to apply to scheelite mineral, economic and also suitable for nano powder production when compared to current tungsten production technique.

Tungsten powder production from scheelite mineral at one step

It is a new tungsten production technique.

According to the process described in this invention, tungsten is produced together with some calcium containing byproducts in molten salt solutions by electrochemical reduction of calcium tungstate in solid state. Metallic tungsten powder is obtained after a cleaning treatment in which calcium containing byproducts are removed by dilute HCl solutions.



Advantages

Applicability to scheelite

The current tungsten production technique is more suitable for wolframite mineral

Easy and fast production

Tungsten production route by this invention is shorter and easier

Low cost

More economical when compared to current tungsten production technique

Nano powder production

Also suitable for nano powder production

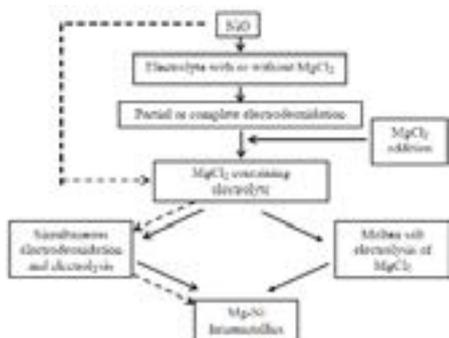
Applicability to other metals

The invention can be applied to other metals having similar properties with tungsten (like Mo)

Combination of Electrodeoxidation and Molten Salt Electrolysis Methods for Intermetallic and/or Alloy Production

Forming Intermetallics and/or Alloys in Molten Salt

This invention provides a method for producing M1M2 or M1M2M3 intermetallics and/or alloys by combining electrodeoxidation and molten salt electrolysis techniques within the same electrochemical cell.



Advantages

Convenience

No need to produce metals forming the intermetallic separately

Economy

Cost effective when compared to processes where metals are produced separately

Purity

Electrochemically produced powders have high purities

Small particle size

The powders, produced by combination of electrodeoxidation and molten salt electrolysis have small particle sizes

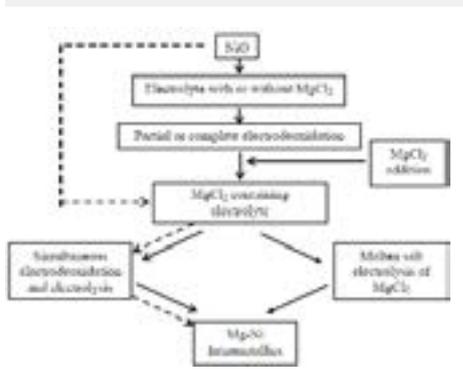
Safety

Mg forms an alloy just after its production in molten salt and is not in contact with air at any stage of the process. So, the accidents which are likely to happen during transportation, stocking, etc. can be prevented

Formation of metals and intermetallics together

The most common methods for producing Mg₂Ni require the use of pure Mg and Ni as starting raw materials. This requires that these metals should have already been produced before intermetallic formation. Therefore, difficulties arise during handling, preparation, and processing due to highly reactive nature of magnesium.

However, MgCl₂ electrolysis was combined with electrodeoxidation of NiO within the same cell to form Mg₂Ni powder in this inventions. Instead of Mg and Ni, MgCl₂ and NiO were used as starting materials which leads to more economical and shorter production route. Moreover, electrochemical formation resulted in fine powder formation which is more suitable for hydrogen storage applications.



High Efficiency Silicon LEDs

Snatching Light from Silicon

Silicon, which forms the basis of modern electronics, unfortunately does not emit the light. On the contrary, its unique properties when produced in the nano scales can transform it into a lamp.

Production of optoelectronic devices can be possible using only silicon

Although LEDs in the markets are very efficient, their fabrication processes are grueling and expensive. Moreover, due to their incompatibility with the Silicon processing technology they are integrated into display units using hybrid techniques, which leads to undesirable effects in performance and efficiency. Considering also the instability problems of OLEDs, our invention shines as it is low-cost with feasible dimensions, Silicon-based, stable and efficient.

Three Silicon based layers of suitable properties are deposited on Cr-coated glass. Indium-Tin-Oxide (ITO) is coated as the optical window. After the production is over, electroforming process is utilized under a calibrated forward bias. The light emission efficiency of the diode is enhanced by at least 30 times after this process. The color of the light can be adjusted by the deposition parameters of the Silicon layers.

Advantages

Silicon-based

Driver circuitry and the light sources of optoelectronic devices are ready in a single fabrication

Low-cost

Production temperature is 250 °C. Number of LEDs to be produced is limited by the reactor dimensions

Efficient

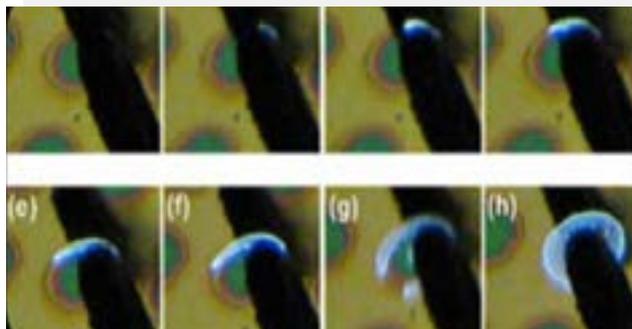
Despite its low-cost production, it is among the highest efficiency Silicon LEDs reported so far

Multi-color

LEDs can be produced to emit light in any desired color including Infrared, visible, ultraviolet regions

Easy-to-produce

Quick and reproducible fabrication using PECVD system



Process for Preparation of Medical Grade Polyurethane Composites Containing Antibacterial Zeolite

Non-Microbial Materials

This invention covers the processes of micro and nano zeolites having antibacterial properties and the polymeric composites containing these zeolites. Preparation processes of both components are in the content of the patent.

Materials having healthy and hygienic property with long term efficiency

Polymeric material was prepared without using any other additive (initiator, solvent, chain extender, etc.) besides its main components. Zeolite powder was prepared in different forms as micro and nano particles and with high $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio, and made antibacterial with silver ions. Composites formed from these two components can be prepared in different forms as film, sponge or fiber.

Antibacterial powder can be added into detergents, polymeric composites can be used in textile (in upholstery fabric, socks); painting industry (in houses, vehicles such as cars, ships); as coatings (metal, ceramic, wood coatings); public places (internet cafés, toilets), paper industry (newspapers, paper money) and health (beds, walls, floors of hospitals, etc).

Advantages

Nanotechnologic

Zeolite particles in micron or nano size

Antibacterial

Prevents the growth of microbes

Long term efficiency

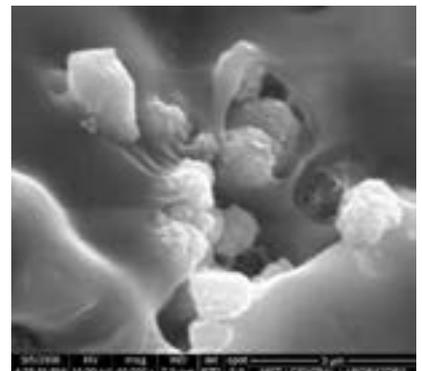
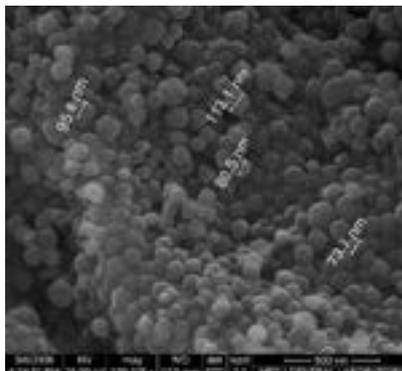
Effects of ions may last for years

Variety

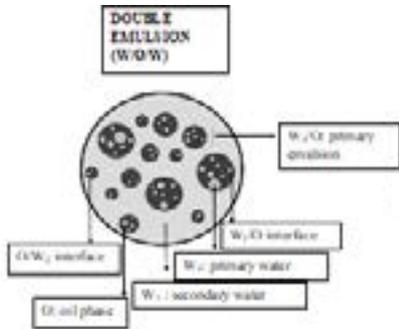
Can be prepared as powder, fiber, film or sponge

Hygienic

Provides clearness in every medium



Production of Low Fat Ice Cream Using Multiple Emulsions



Production of Low Fat Ice Cream

In this invention, it was possible to reduce fat content of ice cream to 2.8% by using double emulsion method and to produce low fat ice cream having similar quality with regular fat containing (12%) ice cream.

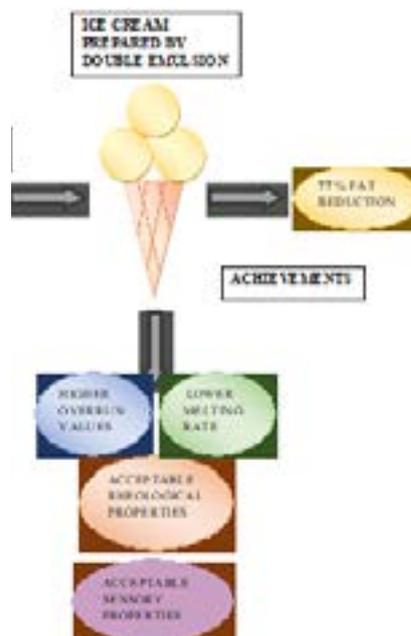
Advantages

- Less fat usage
- Similar physical and sensory properties with regular one
- Natural food grade emulsifiers/stabilizers
- Healthy and natural product for consumers

Reduction of fat content of ice cream

Water/Oil/Water type multiple emulsion was used in the design of low fat ice cream. Gum tragacanth, guar gum, lecithin and Polyglycerol polyricinoleate (PGPR) were used as emulsifier/stabilizer.

Low fat ice cream prepared by this method had similar physical (melt down resistance, overrun, rheological) and sensory (viscosity, mouth coating, acceptability) properties with regular fat containing (12%) ice cream.



Hemicellulose Based Antimicrobial, Antifog Biodegradable Film Capable of Removing Undesired Gases and Production Method Thereof



Make Use of Agricultural or Forestry Waste materials

The patent covers the production of hemicellulose based polymeric nano-composite film or coatings from agricultural or forestry waste materials.

Advantages

Anti-microbial under light

Anti-fog

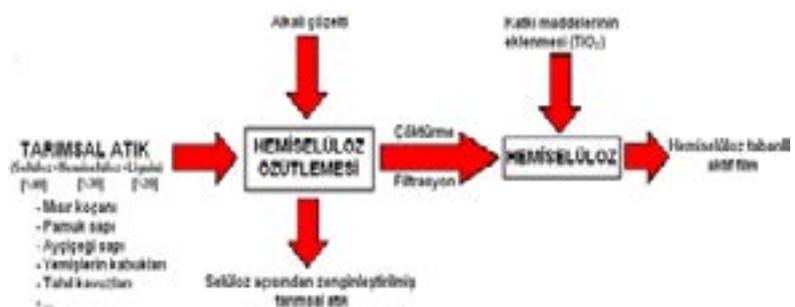
Preventing the formation of various gases

Low oxygen permeability

Provides information for the production of hemicellulose based active packaging material

The hemicellulose based biodegradable film disclosed in the present patent contains photocatalytic titanium dioxide nanoparticles in addition to hemicellulose which gives the film antimicrobial, antifog, and gas removing properties. Therefore, the patent provides information for the production of hemicellulose based active packaging material.

In addition, the film is suitable for food packaging due to its low oxygen permeability.



Determination of the Real Number of Salmonella Pathogen

More Healthy and Safe

Provides cheap, fast, and exact enumeration of Salmonella bacteria for better treatment, more healthy nutrients, and living in more safe environment.



Advantages

Rapid

It is faster than traditional microbiology methods, 90h vs. 21h

Precise

It gives exact the number of Salmonella

Cheap

1 ml of recombinant plasmid solution allows 200 Real-Time

Easy to produce

Unlike genomic DNA, the descending solution can be produced in competent cells repeatedly

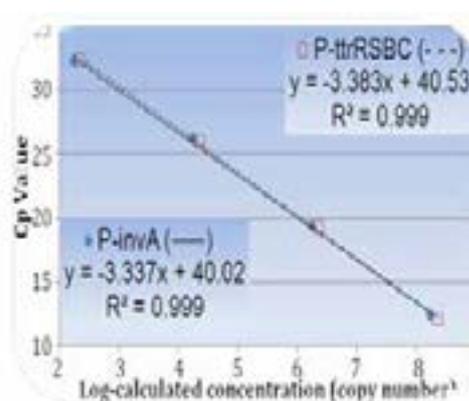
Practical

Constructed calibration curve is valid also for recombinant plasmids produced in competent cells

Recombinant plasmids are used as reference in real-time PCR

Beyond rapid detection methods, absolutely quantitative and cost effective methods that can enumerate low levels of Salmonella are essential for medical, veterinary, food, and environmental sectors. Up to now, only a few studies accurately enumerated Salmonella, but using genomic DNA as reference molecule for rapid and reliable Real-Time PCR technique.

Among reference molecules, plasmid DNA is the most attractive one, it is cheap, easy to produce and convenient. The developed method presents detecting and exact enumeration of Salmonella pathogen using two recombinant plasmids designed as Real-Time PCR reference molecules by cloning two most commonly used Salmonella specific target gene regions 'invA and ttrRSBC' into them.



Copper (II) Oxide Nanoparticles Decorated Zeolite and Their Production

CuO Nanoparticle-Zeolite Hybrid System with Enhanced Carbondioxide (CO₂) Adsorption Capacity

The developed hybrid system capture CO₂ in significantly higher amount than the just zeolite. The system also stores the CO₂ with physical and chemical bonds until its further use.

Advantages

Low cost

Potential to be prepared in an industrial scale

High CO₂ capture and storage capacity

The release of stored CO₂ by simple heat treatment for the future use of the gas

Having the potential use in wide variety of areas in industry

Capturing and storing CO₂ gas in the medium effectively

Zeolite serves as a perfect material for gas separation and purification processes due to the ion exchange properties, adsorbing capacity, selectivity, and porous structure. Zeolites in molecular sieve form are often used in industry to capture various gases such as CO₂. Alternatively, metal oxides in nanoscale with their high surface/volume ratios are also very promising materials on adsorbing and storing gases like CO₂.

In this invention, new CO₂ adsorbing system has been developed by combining zeolites and CO₂. The CO₂ adsorbing capability has been significantly increased by synthesizing CuO nanoparticles on zeolite surface. Moreover, this system allows storage of the captured CO₂ gas by physisorption and chemisorption as well as the release of the gas by simple heat treatment for its further use. System can be produced with an economical method which can be applied in industrial scale.



Microscope images of CuO nanoparticle-zeolite hybrid system.

Microchannel Integrated Radio Frequency MEMS Biosensor



Radio Frequency MEMS Biosensor

No moving part providing robustness and reliability, high sensitivity, low-cost, integrable with autonomous and remote controlled systems.

Advantages

Rapid

Highly sensitive

Robust and reliable

Versatile

Low-cost

Integrity with autonomous and remote-controlled systems

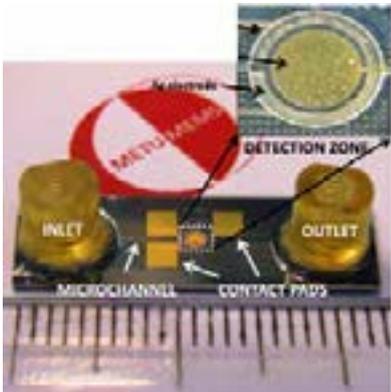
Exploiting RF waves for point-of-care, in-vitro, biological and chemical substance detection

This invention relates to a robust, microwave biosensor fabricated using MEMS fabrication techniques for highly sensitive and selective, rapid, label-free detection of biological or chemical substances.

The biosensor subjected to this invention can be used for In-vitro, Point-of-care diagnostics which can have wide range of applications covering environmental monitoring, drug-discovery, disease diagnosis etc.



Microelectrochemical Sensor



On-chip Bacteria Detection

This invention presents an electrochemical sensor embedded in a microfluidic channel for fast and reliable detection of bacteria from a small amount of sample.

Advantages

Low-Cost
Less cost

More than one type of bacteria detection
Simultaneous detection of various bacteria types

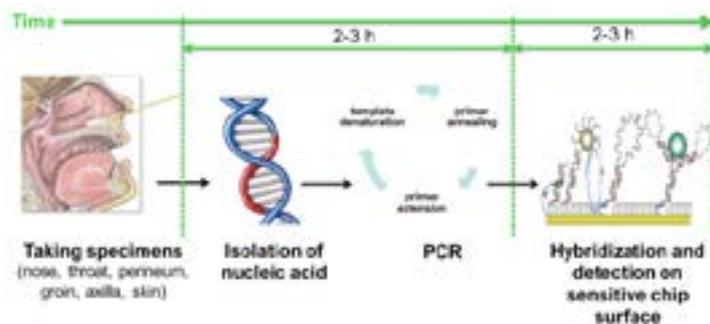
Portable
Integrated microfluidics approach provides portability of the whole detection system

Fast detection
Fast detection in less than 6 hours

Wide applicability
Same device concept can be used to for other detection purposes where DNA based detection is required

Bacteria detection from a small amount of sample in a few hours

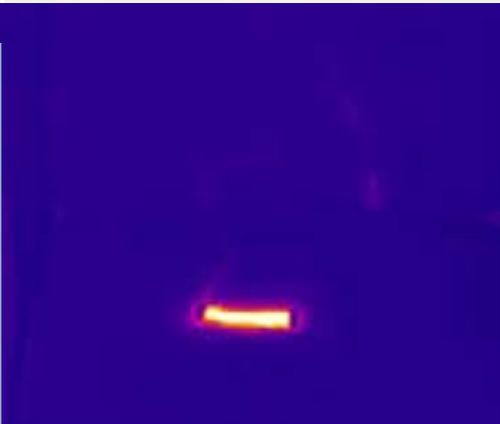
The industry needs disposable lab-on-a-chip systems for detecting various kinds of bacteria simultaneously in a time which is much shorter than the conventional counterparts. This invention allows detection of various kinds of bacteria in 3-6 hour with 3 electrode electrochemical sensor embedded in a parylene microchannel.



Metal Nanowire Decorated Heatable Fabrics

3D Coating on Fabrics with Dip Coating Method of Silver Nanowires

Decoration of silver nanowires as a 3D coating (that is breathable, flexible) onto cotton textiles, following which the coating can be heated through the application of direct current.



Advantages

Fabrics can breathe since they are not covered with a heating element

Very low amount of active material is required, thanks to nanotechnology

Simple dip and dry coating method is used for the fabrication, which is truly scalable

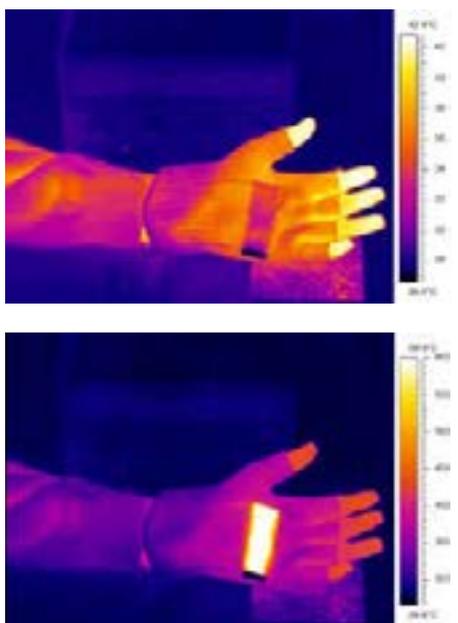
Operates under low currents and consumes very low energy due to high electrical conductivity of nanowires

High temperatures can be attainable at low currents due to high thermal conductivity of nanowires

Fabrication of low power consuming, high performance heatable textiles

In this invention, metal nanowires are decorated onto textiles. Nanowires are then utilized as heating elements.

This coating does not limit the flexibility and breathability of the fabrics. It allows reproducibly heating the fabrics to 60 °C (maximum temperature for wearables), has high turn-on and turn-off response rates. Moreover, it can provide a constant temperature under direct current.



Chips Production Method from Ground Apple

Healthy Snack with Ground Apple

This invention is about snacks like chips and it relates to a method of producing chips from ground apple which has been developed in order to provide a healthy, delicious and low fat chips in the ready-to-eat food sector.



Advantages

- Appropriate for diabetics
- Healthy and delicious
- Has a low fat content
- Prebiotic effect

Healthy, tasty, low fat

In the development of the chip production method from ground apple; production of chips with low fat content, production of chips without starch content, production of chips by adding or not adding fat depending on the necessity and consumption of chips by diabetics are aimed.

The technology of the invention consists of a method in which ground apple is chopped and fried in oil or cooked with microwave energy. The ground apple chips which can be produced via two different methods, has little fat if fried in oil; and has no fat or starch if cooked with microwave energy. At the same time consumption of inulin, which is found in the natural structure of the ground apple, increases calcium absorption in the human body and plays a role in lowering the LDL level, which is known as harmful cholesterol.



Synthesis of Dolomite with Ca(OH)_2 and Mg(OH)_2 Nanodispersive Solution and Consolidation of Deteriorated Dolomite Stone by Forming Dolomite within the Stone

Consolidation of Dolomite by Forming Dolomite within the Stone

This invention provides consolidation of deteriorated dolomite stone by forming dolomite within the stone with the treatment of Ca(OH)_2 and Mg(OH)_2 nanodispersive solution prepared from dolostone itself.

Advantages

Compatible

A material that is chemically and mineralogically compatible with dolomite

Consolidant and Remedial

Improving the physical and physico-mechanical properties of the stone by regenerating dolomite in the weathered/weakened areas of dolostone; allowing stone having its original performance characteristics

Efficient

The nano solution can penetrate into the very fine pores and capillaries and all of the hydroxide nanoparticles in the solution are able to form dolomite by carbonation process

Easy production

Ca(OH)_2 and Mg(OH)_2 nanodispersive solution can be prepared in the laboratory in 2 days and this solution can form dolomite in 7-10 days

Non-destructive in-situ application

It is a treatment method which can be applied on site and does not give any damage to the dolostone itself

A unique nano dispersive solution to be used as remedial and anti-weathering consolidation treatment purposes for elongating the service life of dolostone

Ca(OH)_2 and Mg(OH)_2 (calcium hydroxide and magnesium hydroxide) nanodispersive solution was prepared from dolomite stone itself (CaMgCO_3 - calcium magnesium carbonate).

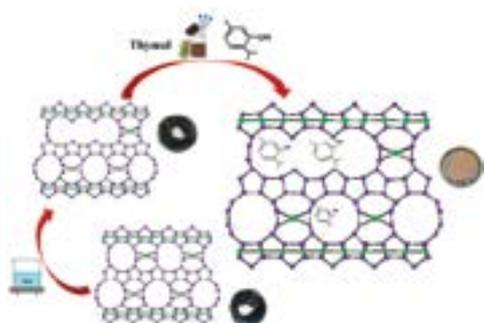
This solution was applied to deteriorated dolomite stone and carbonated within the stone under proper conditions (high relative humidity (90-95%) and high CO_2 partial pressure ($p\text{CO}_2 \sim 0.4 \text{ atm}$)) to form dolomite. In this way, it will be possible to consolidate the historical buildings which are dolomite. The most important issue in this consolidation is to integrate chemically and mineralogically compatible material with the structure itself. Besides compability, physical and physicomachanical properties of weak stone will be improved and the application will be non-destructive and on-site.

That is a treatment based on strengthening the dolostone with a consolidation solution fully-compatible with its microstructure. It is a process something like regenerating the dolomite with its own stem cells.

Hierarchical antimicrobial zeolitic materials encapsulated essential oils with increased thermal stability

Hierarchical antimicrobial nanoporous materials

Organic molecules to be used in different fields of industry as antimicrobial agents as an alternative to toxic inorganic elements

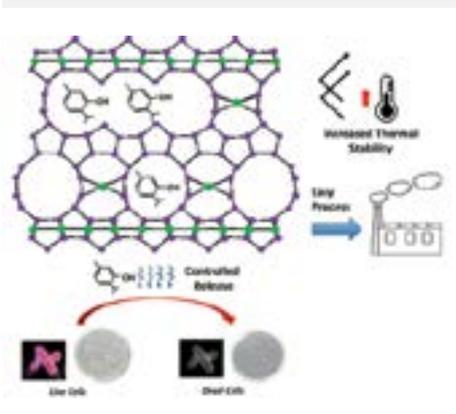


Advantages

- 1. Thermal Stability:** Higher thermal stability of essential oils with encapsulation process.
- 2. Controlled release:** Controlled release of essential oils with encapsulation process.
- 3. Low cost:** Low cost in the encapsulation process by using the desiccator method comparing with wet chemistry methods.
- 4. Practical in use:** Easy use in the encapsulation process by using the desiccator method comparing with wet chemistry methods.
- 5. Ease of application:** Easy process in industry.

An antimicrobial powder agent has been developed to be used as an additive in making of surfaces, textiles, paints during the production stage for the purpose of removing undesired bacteria and pathogens. Instead of antimicrobial agents that are thought to be harmful, such as silver, an alternative compound with **high thermal resistance** was developed that is benign to **environmental** regulations.

Essential oils could not be utilized in applications due to difficulties in processing, as they have low thermal resistance and are volatile. It is known that the thermal resistance of these essential oils increases after they are encapsulated into a porous structure. However, it is expected that the pore size range required for placement thereto, needs to be similar to or larger than the size of these molecules. In this invention, the thermal resistance of these volatile organic molecules encapsulated into zeolitic materials, which have a hierarchical structure by expanding the pores, has increased, and so antimicrobial effect and antimicrobial duration have increased. In the invention, essential oil molecules were encapsulated in a hierarchical zeolitic material with the gas absorption technique leading to enhanced adsorption. In this way, it has been made possible to use organic volatile molecules as antimicrobial additives in various sectors, which was not possible due to difficulties in processing until now.



Usage of Potash and Calcite as Additives to Natural Aluminasilicates for Direct Synthesis of Zeolite 3A and Zeolite 5A

Pore diameter adjustable zeolite synthesis

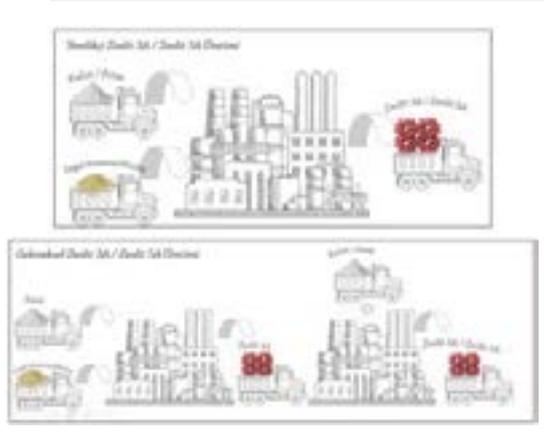
In standard production methods, additional ion exchange procedures should be applied to obtain these zeolites while this production method is free of ion Exchange thus shorter, faster and cheaper.

Direct, faster and cheaper production of zeolite 3A and zeolite 5A which is commonly used as dessicants and gas seperation process' in industry

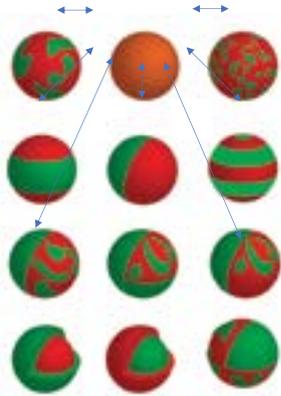
Standard production of zeolite 3A and 5A consist of zeolite 4A synthesis which is the sodium form of the Linde Type A (LTA) family followed by the ion exchange with calcium and potassium sources. This unique production method offers ion Exchange free production thus it is faster, cheaper and high quality final products.

Advantages

1. Lowering Process Steps
2. Faster Process
3. Lowering Equipment Costs
4. Lowering Production Costs
5. Ability to produce desired Na/Ca and Na/K zeolites



Micro- and Nano-sized anisotropic particle production technique



Metalik anisotropic micro-, nano-particles

This invention enables the production of anisotropic particles from various metal alloys with high yield and scalability. Anisotropic shapes and compositions which can be produced include, but not limited to, Janus, patchy, striped, composite, core-shell structures.

Advantages

Useful: can be applied to various alloy systems, scalable

Visible: various morphologies can be obtained from the same alloy particles

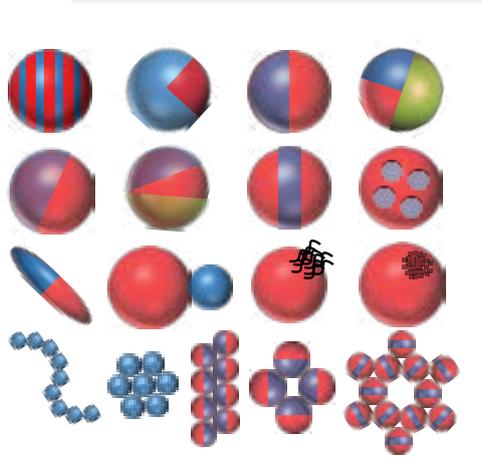
Efficient: suitable for producing tens of grams of particles in a single batch. Standard techniques are used in particle production, there is no need for specially trained personnel with high skills.

High performance: tens of grams of particles can be produced in one batch

Sensitive: Similar morphologies can be easily obtained in significant portion of the resulting particles.

A novel method for the scalable production of anisotropic particles

Equilibrium microstructures that can be obtained by solidification of alloys are known. The present invention is based on the design of microstructures based on the solidification conditions of the particles, particle size, and/or external conditions. This invention focuses on the production of micro- and nano-sized particles in various morphologies and composition distributions depending on the solidification in equilibrium or nonequilibrium conditions, particle size and the external factors.





Defence and Security

Passive MMW Imaging System for Remote Detection of Concealed Objects under the Clothes on Humans



Imaging of Concealed Objects Under The Clothes on Humans

It is a new system which is developed for imaging of concealed objects over long distances. As it provides resolution improvement according to distance, It offers the possibility to use in long distances.

Advantages

Provides resolution improvement according to distance

It can be used in the desired environment (indoor, outdoor) due to being a passive system

It does not harm human health

Imaging of concealed objects under the clothes

Because of being a scanning system, wide field of view can be displayed

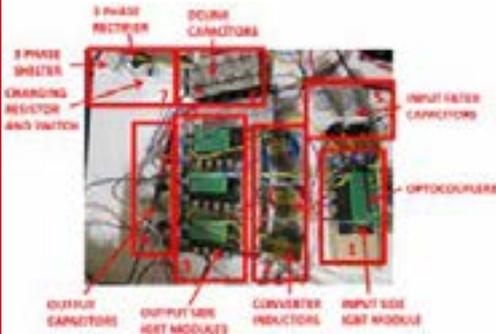
This saves time for the security forces to take the necessary countermeasure

The invention provides resolution improvement according to the distance with an application-specific optical design. Thus, imaging of the concealed objects according to the long distances is provided. It introduces the concept of imaging according to distance to the existing systems.

It helps concealed weapon detection over long distances (10 m - 50 m as an example) and it allows the detection of threat elements such as weapons, explosives etc. from long distances.



Sine Output Downloader for Variable Frequency and Variable Voltage Applications



High-Efficiency Variable Voltage Input 3-Phase Sine Output Converter

By providing higher efficiency than current technology, AC (Alternative Current) can be produced at desired voltage and frequency even at low input voltage levels.

Advantages

Reduced number of active switches (semiconductors)

Function at low input voltage levels

Generating AA energy at the desired voltage and frequency at low wind speeds

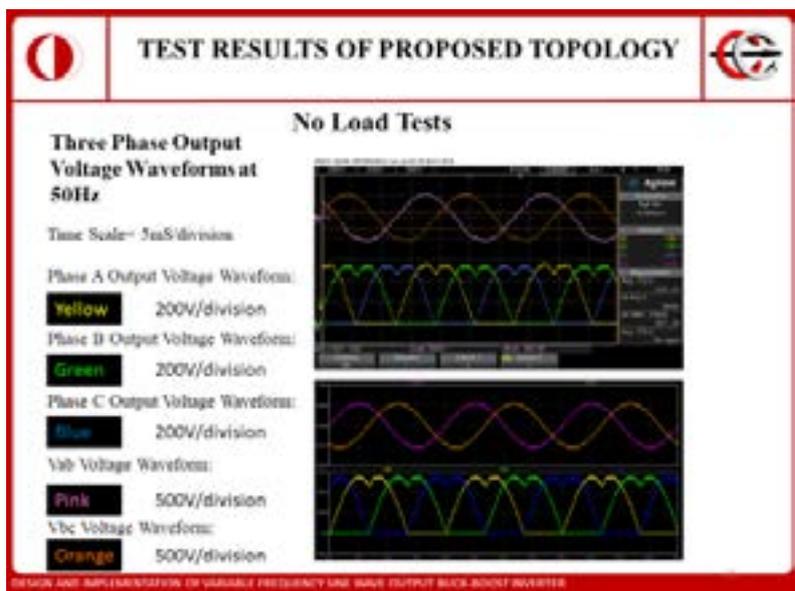
Generating AA energy at desired voltage and frequency at low solar radiation levels

Reduced maintenance and extended service life of engines driven by this circuit

Pulse-free low-distortion sine output

Today, there are 3 phase AC voltage generating systems. But in most of these applications the output voltage is dependent on the input voltage. As the output voltage drops when the input voltage drops, the inverter cannot operate at rated power. Thanks to the invention, it is possible to reduce the dependence on the input voltage and to operate at lower voltages.

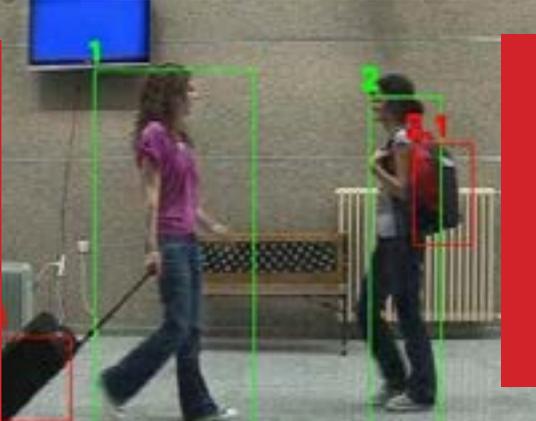
In addition, a pulse modulated voltage occurs at the output of most existing systems. Filters are used to dampen this impact. Thanks to the invention, this problem is solved without the need to use filters.



Object Tracking and Abandoned Object Detection Using Visible and Thermal Cameras

Intelligent Video Surveillance

It prevents false detections due to stationary objects, such as people sitting on a bench and enables detection and tracking of the person abandoned the object.



Advantages

Reliable

Has low false alarm rate

Different

Enables individual tracking of people and the objects they carry

Security

Increases the security of public spaces such as airports and shopping malls

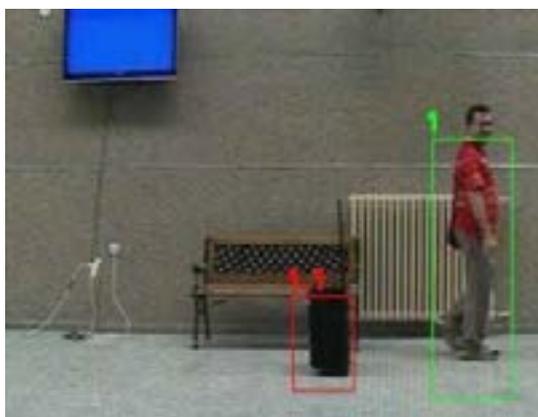
Automatic

Works fully automatic

Be informed of potential security threats by intelligent video surveillance

Rapid detection of abandoned objects is important for the security of public areas. While the security personnel is employed to detect suspicious objects, it is difficult to detect these in a timely fashion to prevent catastrophic events. As such, real time systems with false alarm rate are desirable.

The thermal cameras which are used in addition to visible band cameras provide heat signatures. This enables detection and tracking of people and their belongings individually. Hence, it allows extraction of information that a person in the camera view has a luggage and cases such as abandonment of the luggage or passing the luggage over to another person could be detected.



Nonsymmetrical Wideband Dipole Antennas

Multi-Purpose Dipole Antenna

An antenna with a low profile, efficient and wideband over three octave which can be adapted on any platform allowing it to be conformed to the surfaces.

Can be used as a multi-purpose wideband antenna for both civilian and military applications

In many devices including our GSM telephones, multiple narrowband antennas are used due to their efficiency.

These antennas require large spaces, interfere with each other and increase the system complexity. It is possible to do the same job with a single antenna. The dipole antenna developed in this invention has low profile, and conformal which allows us to mount it on any surface. Thanks to its special design, it can be used over three octave band efficiently. This antenna requires less space, and weight making it a good candidate for many applications.

Advantages

Wideband

Can work over three octave band

Efficient

A good solution for efficient communication

Conformal

Can be adapted to any platform and surface

Cost-effective

Can replace multiple antennas

SWAP

Effective size, weight and power use



A System and a Method for Simultaneous Position, Mutual Coupling and Gain/Phase Calibration of Antenna Arrays

Antenna Calibration System

Antenna labels and laser technology are used to measure the antenna position, orientation and inclination with great accuracy. This measurement and calibration improves the cell size and coverage of each antenna.

Antenna coating and optical labels are used for calibration

Misalignment of antennas on the mast is an important problem decreasing the effective area where the antenna covers. The measurement of antenna position, orientation and inclination from a distance is required for a calibrated system.

A special coating and label are placed on each antenna for identification and positioning using laser technology (Lidar).

Lidar reads these labels to determine the antenna position, orientation and inclination. The distance and positioning between antennas are also adjusted. This technology determines the mechanical positioning of each antenna with great accuracy.

Advantages

Identify

Optical labels on each antenna identifies the antenna

Calibration

Optical labels on each antenna are used to determine position, orientation and inclination accurately

Coverage

Accurate positioning of antennas improves the antenna coverage and communication

Effective

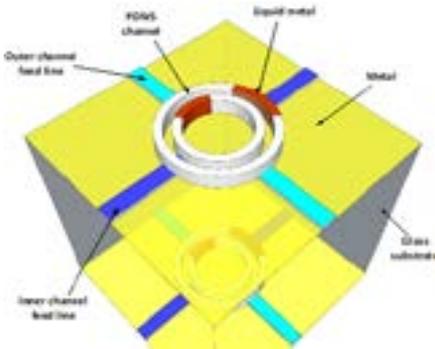
Laser technology allows accurate positioning and identification

Simple

Antenna calibration is performed from a distance



Phase Shifting Method for Reconfigurable Transmitarrays and Reflectarrays and a Unit Element Thereof



Tunable Antenna Using Microfluidics

Movement of the liquid metal in a microfluidic channel integrated with the antenna provides 360° linear phase shift range in the transmitted or reflected field.

Advantages

Compact and Low-cost

No metallic lines and bias circuitry required

Minimized parasitic radiation

No need for metallic bias lines causing parasitic radiation

Scalable

Use of micromachining enables adjustable size and so operation frequency

No tear or wear

Does not wear or tear due to its fluidic actuation nature

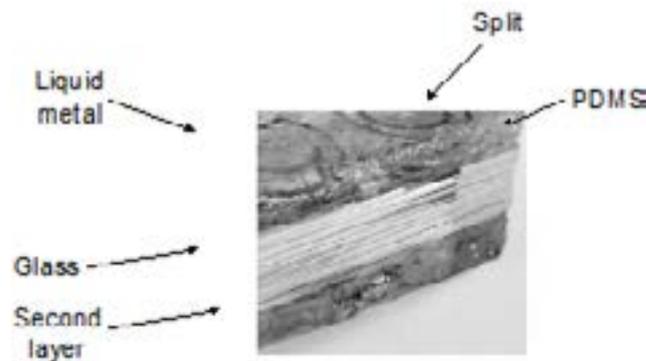
Flexible and wearable

Utilizing microfluidics and flexible substrates enable wearable antennas and antenna arrays

A dynamic phase tuning mechanism for reconfigurable transmit/reflectarrays

There is a need for an alternative method for tunable antenna arrays complementing parabolic reflectors used in telecommunications requiring high antenna gain. Moreover, wearable and flexible antennas are important for military applications.

Combining microfluidics and antenna technologies enables implementing flexible and wearable antennas which can adapt to the wearer. The transmitarray element and phase tuning mechanism comprise nested ring-split ring elements where the rings are in the form of microfluidic channels. The liquid metal is confined in these channels. Changing the position of the split along the channel by rotating the liquid metal realizes the rotation of the element.



Mechanical Thermal Camera

A MEMS Thermal Camera Based On Mechanical Resonance

Unlike other thermal cameras, the image is obtained by mechanical vibrations of pixels. Thus it has wider dynamic range, higher resolution and lower power consumption compared to other available thermal cameras.



Advantages

Continuous measurement improves the precision

Measuring the frequency of resonance eliminates the need for an analog-to-digital converter and decreases the power consumption

The use of structural vibration modes of the pixels provides smaller pixels

The lowest and highest operational incident infrared radiation is limited by a structural failure

High frames-per-second (fps) count

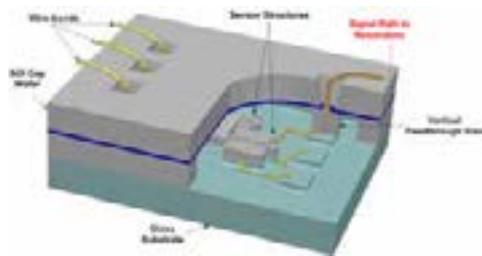
The thermal image is obtained by determination of the mechanical resonant frequency of pixels

Thermal imaging has been commonly used in agriculture, defense and non-military industries. High precision and resolution together with low power consumption and miniaturization of these thermal cameras are common needs of these sectors. With the implementation of the proposed camera focal plane array structure, there is an expected improvement in all these needs itemized above. As known, the tunes (the vibration frequency of the strings) of stringed instruments are dependent of the ambient temperature, and thus, counting the frequency, the true temperature of the spring can be obtained.

Similarly, with the resonant pixel structures, the frequency shifts due to incident infrared radiation on the pixels will be detected. Counting the shift in the frequency will eliminate the need for an analog-to-digital converter and improve the resolution and dynamic range of the pixel. As a result, smaller pixels, and thus, with the same die size, higher resolution thermal cameras with lower energy consumption will be possible.



MEMS Temperature Sensor



Sub-mK temperature resolution

The most important aspect of the invention is that temperature sensor structure can be integrated to other micro systems at the layout level. Thus, it will be possible to solve temperature dependent performance fluctuations of these micro systems.

Advantages

Layout level integration

Layout level integration eases temperature corrections of other MEMS devices

Frequency based measurements

Direct counting of the resonance frequency annihilates the need for an analog-to-digital converter while lowering power consumption

Use of structural vibration modes

Which enables smaller foot-prints

Wide dynamic range

The measurable temperature band is limited only by the thermal damage (cold or hot) on the structure

High shock-survivability

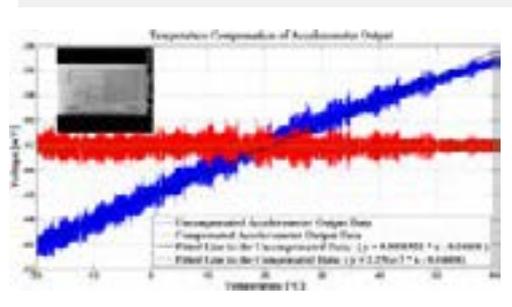
Due to its simple structure, it is resistant to high levels of accelerations and shocks

Low cost, ultra sensitive, high bandwidth temperature sensing

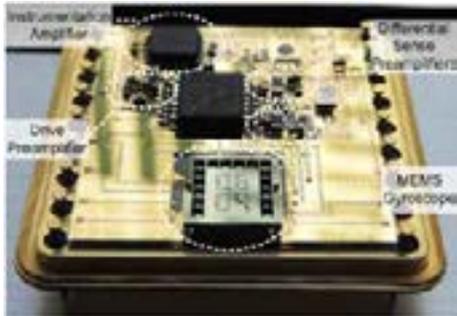
A low cost, ultra sensitive, high bandwidth MEMS temperature sensing with frequency output has been developed with the invention.

Stringed instruments have a temperature dependent chord. If this frequency is counted, the real temperature of the string can be found. Similar to this, if the shift in the resonance frequency of the sensor structure is counted, the resolution and the dynamic range of the sensor is improved while eliminating the need for an analog-to-digital converter. As a result, a low cost, ultra sensitive, high bandwidth MEMS temperature sensor with frequency output can be obtained, which can be integrated to other micro systems at the layout level.

The sensor can be integrated to other micro systems at the layout level. Thus, the temperature measurements will be faster more accurate, which will results in better and more reliable suppression of temperature dependent performance fluctuations of the integrated micro system.



Method for Suppression of G-Sensitivity of MEMS Gyroscope



An Acceleration-Immune Gyroscope

With the method proposed, it is possible to mitigate the acceleration sensitivity of a MEMS gyroscope while obtaining an acceleration measurement with the help of available electrodes on the structure, or by adding special electrodes for this purpose.

Advantages

It is possible to mitigate the effect of external acceleration on the gyroscope output using an electronic feedback circuitry, without modifying the micro structure

It is possible to mitigate the mechanical acceleration response of the gyroscope with additional electrodes on the micro structure

The method is compatible with both closed and open loop readout approaches

From the gyroscope that this method is applied, it is possible to obtain both rate and acceleration readings simultaneously

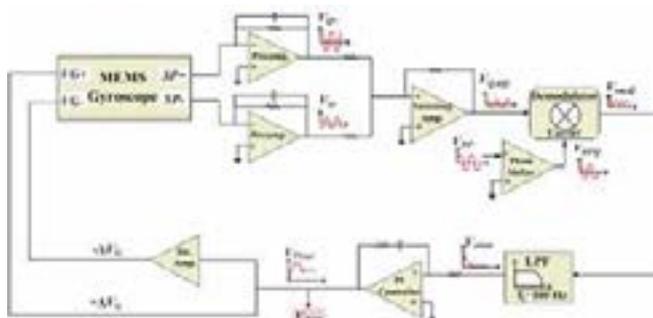
The method can be applied to all capacitive MEMS gyroscopes that are based on linear vibrations

A method mitigating the effects of quasi-stationary acceleration on MEMS gyroscope

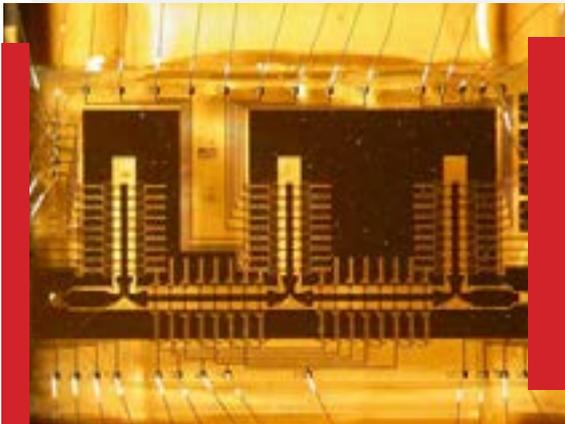
The invention provides mitigation of effects of quasi-static acceleration on the gyroscope output.

The quasi-static acceleration along the sense axis of a gyroscope is a major error source for the gyroscope output. For the gyroscope to provide a reliable output, it should be independent of the quasi-static acceleration acting on the sensor. In this invention, the quasi-static external acceleration is sensed through the readout electrodes with a specialized circuitry. The motion induced by the external acceleration is suppressed with the help of a feedback circuitry. Thus, the sensitivity to quasi-static acceleration is suppressed.

Considering the application areas of a high performance MEMS gyroscope, it is required for the outputs of these sensors not to be affected by the accelerations during operation.



Simultaneous Phase and Amplitude Control Using Triple Stub Topology and Its Implementation Using RF MEMS Technology



Less Component, More Functionality

The proposed component can simultaneously do the phase shifting, amplitude control, and impedance matching functions of instead of using three separate components in an RF circuit.

Advantages

Multifunctional

Performs phase shifting, amplitude control, and impedance matching simultaneously

Single Component

Only one component for three different functions

Low Cost

Can be fabricated with low cost in several different technologies

Small

Can have small dimensions

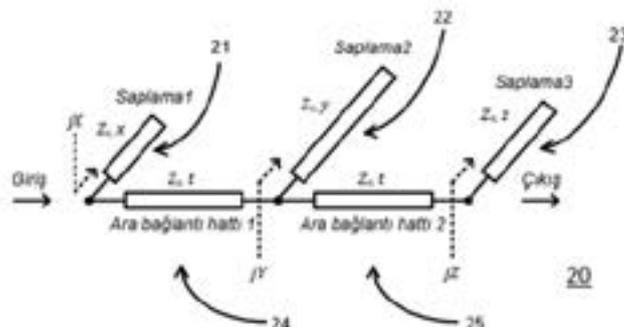
Compatibility

Can be fabricated with several state-of-the-art fabrication technologies

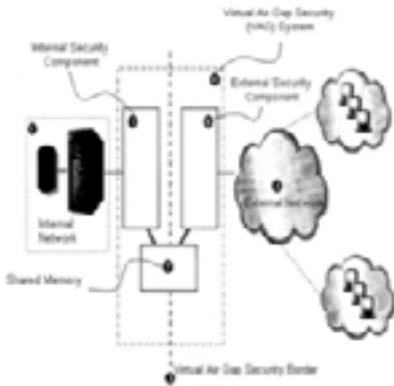
A new component that replaces the functions of three separate components in an RF circuit

The RF circuits in almost all wireless communication systems are expected to be smaller, simpler, and low-cost. At this point, the industry is always targeting components that have lower dimensions, can decrease system complexity and overall cost.

The proposed component uses the triple stub circuit topology which makes it possible to control the insertion phase and amplitude of a given signal while it also performs impedance matching, replacing the phase shifter, amplitude controller (attenuator etc.), and impedance tuner components by a single component. As a result, the total cost and system complexity can be reduced significantly.



Virtual Air Gap – VAG System



File and Data Exchange Security

This invention relates to a virtual air gap-VAG system developed in order to provide Internet and computer security.

Advantages

- Security without IP connectivity
- Multi-layer security
- Controllable data flow
- Identification of a possible source of attack
- Bi-directional insulation

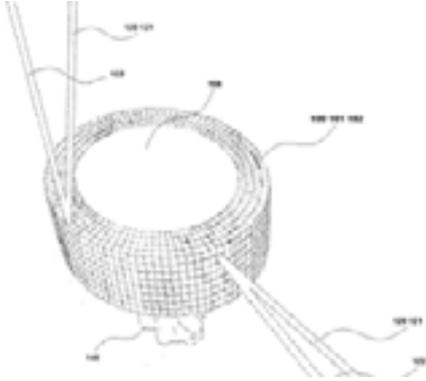
Isolates such systems of institutions utilizing Internet protocols from the Internet, but still enables continuation of real time communication

Virtual air gap system developed under this invention has been devised in order to protect those institutions connected on corporate status to the Internet and receiving/ providing real time service over the Internet against current security threats as well as to eliminate such threats. The system, positioned between the external network (the Internet) (2) and the internal network (organizational net) (1), is not making use of IP based communication internally, and thereby a “ virtual air gap “ border is created between the two nets, enabling a high level of security.

Such characteristic of the system is providing the desired security solution with respect to secure connection to the Internet for such corporate networks carrying out (critical) tasks of high level of security.



Adaptive Methods and Mechanisms for Fast Lidar (Light Detection and Distance Detection) and Location Detection Applications



3D Imaging for Autonomous Systems (LIDAR)

The invention is about an optical scanning device with cost-effective minimal moving parts.

Advantages

Convenient

Very close to the end user with portable design

Cost advantage

Including raw material, small amount of labor compared to equivalent products

Efficient

No limitation except mechanical rotation speed

High performance

Lifts the bottleneck at mechanical scanning speed and is proportional to the laser pulse rate of the decelerating agent

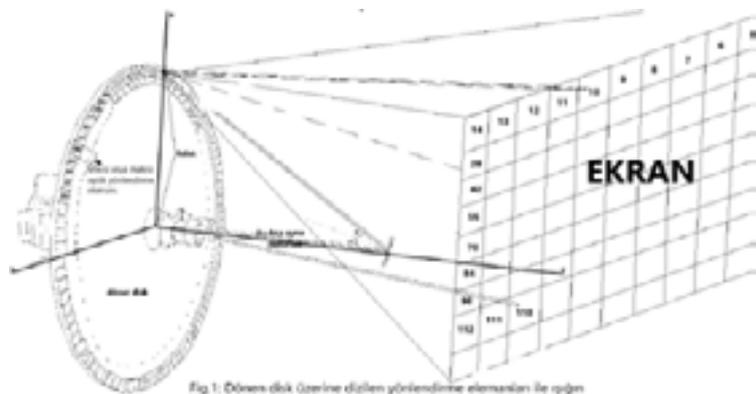
Sensitivity

High-precision scene scanning

Adjustable viewing angle, fast, advantageous cost and easy-to-control scanning

The micro-mirror elements that make up the present invention can address the scene in pixel by pixels and scan the scene effectively using the geometric rotation positions of mirror.

The invention also includes a design which eliminates rotation on both axes. According to their equivalent ones even for the amount of raw materials is advantageous in terms of cost.



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Thank you for your interest in this book and for your support of the field of behavior analysis.

Very truly yours,
John M. Hayes

John M. Hayes, Ph.D., is a professor of psychology at the University of California, Santa Barbara.

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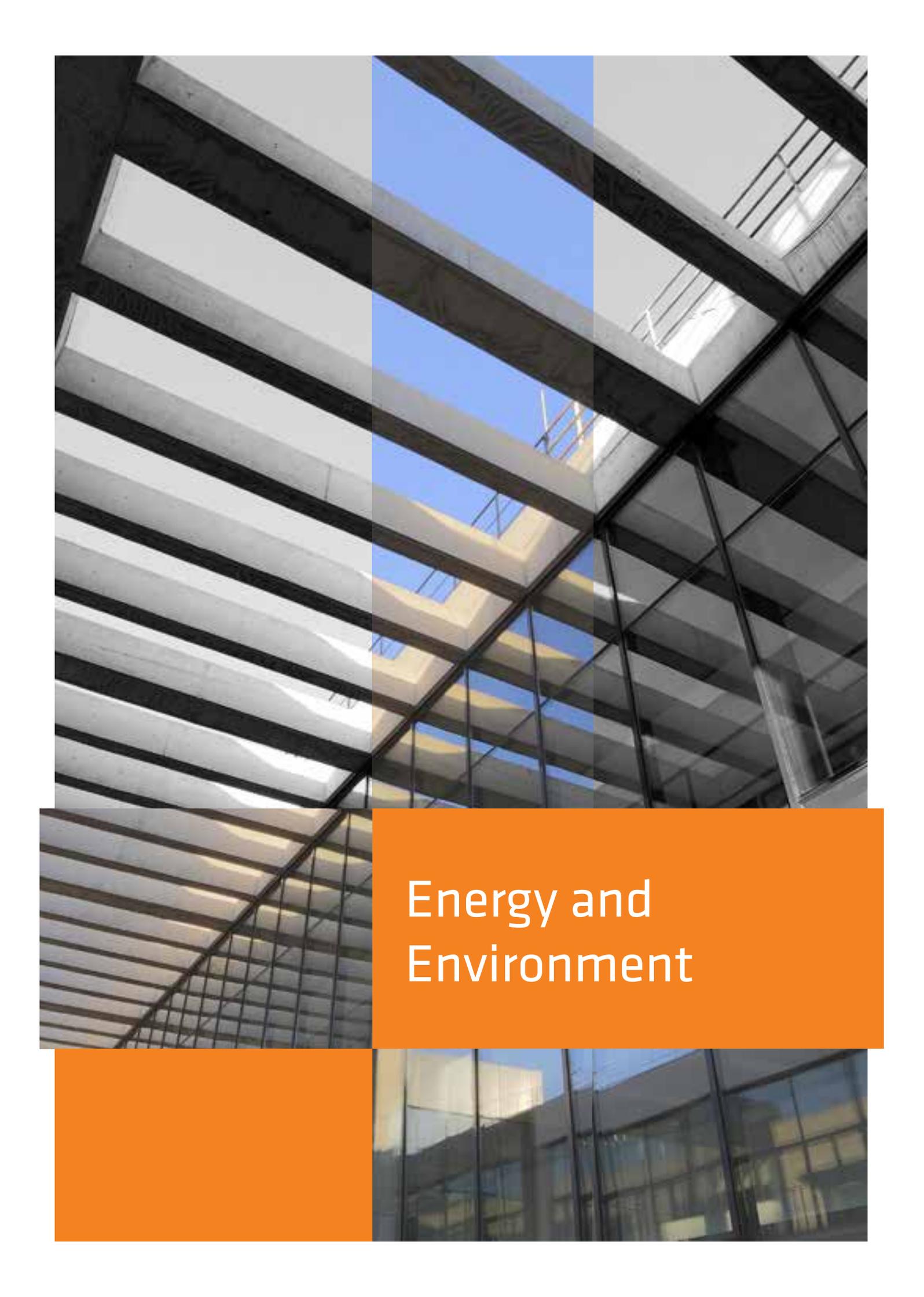
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Energy and Environment

Aerobic Waste Sludge Digestion with Intermittent Ozone Dosing

Ozone-Assisted Advanced Sludge Digestion

The waste sludge which is aerobically digested in 15-30 days in the standard procedure with 30-40% performance; is now being digested with 70-80% performance in 4 days. Residual sludge is disinfected and it is toxicant free.

Advantages

- Reduced contact period, smaller footprint
- Higher digestion percentage
- Entrapped phosphorus in sludge
- Disinfected peat- like residue
- Residual sludge, free from toxic contaminants

Environmental, friendly and economical solution for waste sludge disposal

Anaerobic sludge digestion is preferred over the aerobic owing to its lower energy consumption; yet it is not suited for the new-age treatment plants. Whereas contact period in ozone assisted process reduces to 4 days from 15 days and extent of digestion goes up to >80% from the early 30-40%. The process is well suited to the modern plants by preventing phosphorus leakage and by producing toxicant free final residue.

With this invention ozone is intermittently dosed during 4 days into aerobic sludge digestion to give a particular ozone concentration in the liquid. At the end of this application sludge digestion increased >80% from 30-40% and the process duration reduced to 4 days from early 15-30 days. Residual sludge is disinfected and free from toxic contaminants.



CMOS Compatible Microchannel Heat Sink for Electronic Cooling and Its Fabrication



Micro-Cooler

The invention allows cooling of microchips with integrated microfluidic channels in a fast and efficient manner. The channel fabrication process is very simple and CMOS compatible.

Advantages

Low-Cost

MEMS fabrication reduces cost

CMOS Compatibility

Fabrication process of the microchannels is CMOS compatible

Simple Fabrication

Very simple fabrication process of the microchannels

Effective Cooling

The approach can cool down microchips much faster than the previously reported approaches

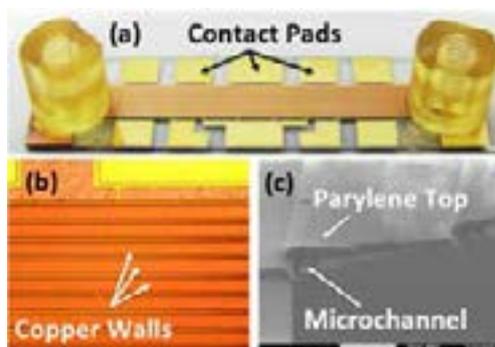
Wide applicability

Same device concept can be used to for other systems such as laser systems where cooling is necessary

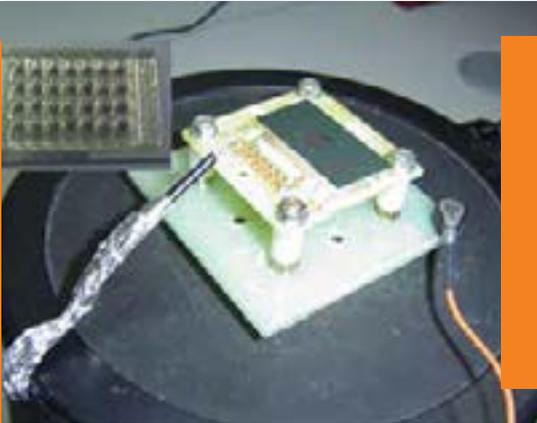
Microchips are cooled with integrated microfluidic channels in a fast and efficient manner

Microchannel heat sinks are basically compact heat exchangers with very high area/volume ratio. In order to minimize the thermal resistance, and for easy system integration the microchannels should be integrated with the circuit; therefore having a CMOS compatible fabrication flow for the microchannels is very important.

In this invention, a new, CMOS compatible, simple, low-cost fabrication technique for microchannels has been developed using metal and polymer materials. The microchannel heat sink can be fabricated monolithically with the circuit on the same process flow without requiring any change in the design of the circuit, unlike the available techniques. Moreover, the polymer coating prevents the excess heat from expanding to other system elements.



Method of Energy Harvesting Using Built-in Potential Difference of Metal-to-Metal Junctions and Device Thereof Vibration to Electrical Energy Converter Over Large Areas



Electricity Through a Touch

Scalable so that random vibration sources in different points over large areas can be harnessed to yield a single electrical output.

Advantages

Low-Cost

Simplicity of the device reduces cost

Scalable

Multiple devices can be placed on large surfaces

Embeddable

The device can be embedded within structure allowing covert integration

Flexible

The electrodes can be made of flexible materials to be integrated on alike

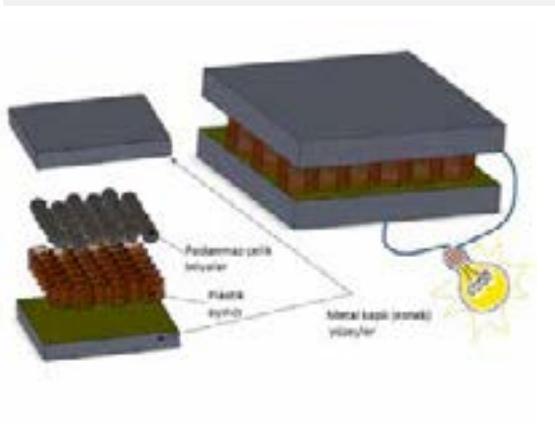
Wide applicability

Same device concept can be used to harness random vibration contraction-extension, or rotation

Converts motion to electricity realizing wireless/battery-free autonomous systems

It shakes steel balls between two different electrodes yields charge transfer induced by contact potential difference and encapsulating a large number of freely-moving balls within insulating guide channels between two electrodes allows a simple vibration harvester. Each ball acts like an independent electrical charge shuttle to contribute to overall generated electricity.

It does not require a redesign for different vibration sources. It is possible to merge the generated electricity from completely uncorrelated vibration sources into a single output and generate electricity over large surfaces with a accost-effective device.



Energy Dissipating Connector

A Replaceable Energy Dissipating Connector for Light-Gage Steel and Wood Structures

The invention is a connector that has superior stiffness and load capacity and can be fabricated simply and inexpensively. It also allows high energy dissipation through plastic deformation of anchor rod.

A safe and efficient force transfer between wall panels and from wall panels to foundation system

Connections between wall panels and from wall panels to the foundation system are required in light-gage and wood structural systems in order to resist the effects such as those caused by wind and earthquake. For this purpose, connection elements called "hold-down" are used in practice. In addition to their stiffness and load capacity, energy dissipation characteristics of these connections become very important for performance of the structural system under lateral loads.

The invention utilizes a geometry that significantly differs from most of the hold-down devices widely used in the industry. This geometry results in a more efficient force transfer mechanism in the connection. This new geometry also allows the plastic deformations to be localized within the anchor rod with no major deformations occurring in the rest of the structural system during disasters such as an earthquake or a hurricane.

Advantages

The hold-down device possesses superior load capacity and stiffness

No plastic deformation is expected on the hold-down device under lateral load effects such as those due to earthquake and wind

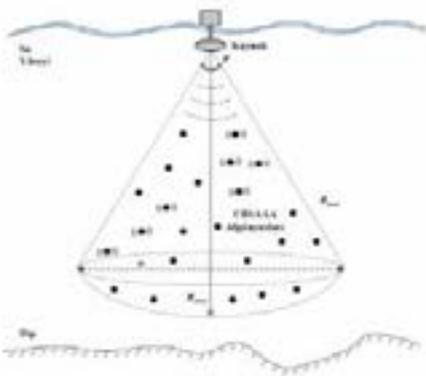
Fabrication of the hold-down device can be made with low-cost and simple fabrication techniques using conventional equipment

Major deformations in the remaining parts of the structure can be eliminated by having all plastic deformations concentrating on anchor rods

The damaged anchor rods can be replaced when needed



A Sensor for Remotely Powered Underwater Acoustic Sensor Networks



Continuous, Economical, Maintainable Sensing

With the novel system and method developed, supplying battery-free and nature-friendly underwater sensors with energy from a remote acoustic source prolongs network lifetime indefinitely.

Advantages

Battery free

Avoids battery weight, hardware, and charging/changing difficulties

Network lifetime

Energy is not a parameter in battery-free sensor network design

Maintainable

Infinite network lifetime enables long-time untethered operation

Economical

Removes the electrical and mechanical design cost required for battery

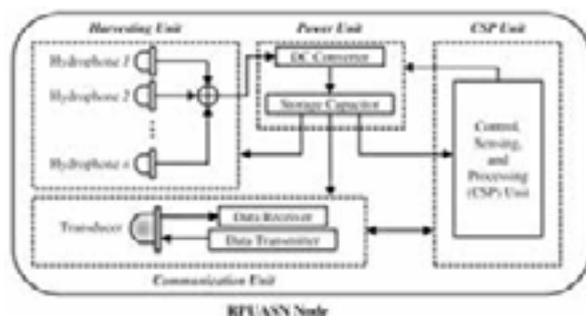
Environment friendly

Avoids possible chemical damage of battery to the nature

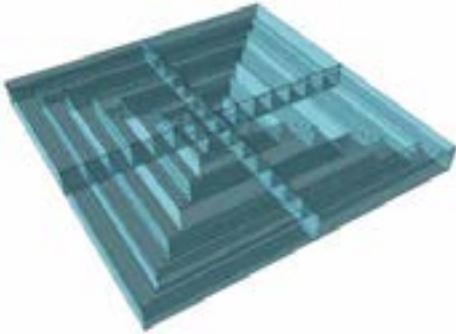
Battery-free sensors enable infinite lifetime and maintainable underwater networks

In critical applications such as harbor security, oil industry, aquaculture, communication with unmanned underwater vehicles, fishing, and defence, relatively infinite lifetime sensor networks free from energy constraints will yield crucial economical profits, enable environment-friendly operation owing to the battery-free structure, and will seriously increase the technical capabilities of these systems.

Piezoelectric structures converting acoustic energy into electrical energy and rapidly charging supercapacitors providing instantaneous high power enable the development of battery-free underwater sensors, removing the energy constraint in the design of network technologies. In this novel design, communication range and sensing coverage are shown to be feasible with realistic parameters.



Acoustical Diffuser-Absorber Panel System for Interiors



Aesthetics of Sound Scattering

Provides controlled and even distribution of sound within acoustically sensitive spaces such as concert halls, conference halls or studios and sound generating spaces like malls, foyers, terminals.

Advantages

High acoustical performance

In a wide range of frequency bands in terms of absorption, diffusion or scattering

Light-permeable

Applicable to transparent or translucent materials; glass, acrylic-PVC, polycarbonate

Lightweight, thin

Minimum widths, occupies less space, thin section, movable, hang-able

Unique design

Aesthetic/decorative

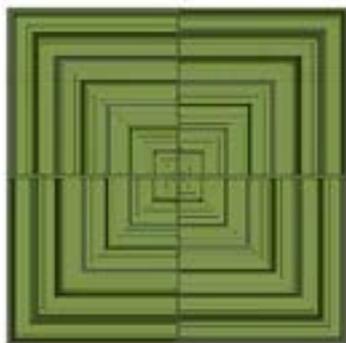
Portability and flexibility

Different design alternatives, can be located anywhere in the room

Sound absorptive and diffusive decorative panel system for interiors

In standard applications, thick diffusers or panels with deep air gaps behind are being used for providing enough scattering or absorption of low frequency sound energy content. The widths of those panels often lead to undesired space losses within interiors either applied on walls or ceilings.

The designed product is superior in terms of its moderate dimensions which are preserved at minimum while keeping its low frequency performance at maximum by applying various acoustical methods and theories (micro-perforation, QRD and Helmholtz approaches). The panel system has different surface properties on both sides providing different acoustical and visual qualities.



Microwave Assisted Synthesis Method of Orthoborates Having Phosphorous Properties



Fast and Easy Way to Produce Phosphorescent Borate Materials

Our method is facile and fast to produce phosphorescent products for LED.

Advantages

Short-time preparation

No extra synthesis step

Easy application

Color and intensity can easily be adjusted as the mixture of compounds is prepared in the desired combination

Saving time and energy

Shorter heating times

Homogeneous distribution

It is easier to prepare composite or slurry solution during fabrication

Clean product

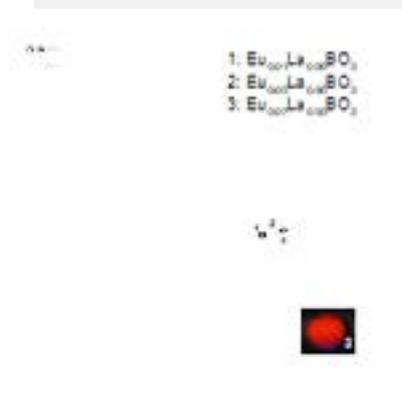
The product obtained can be used without purification

Easy and possible to tune all luminescent properties of materials

In the synthesis method of the present invention, various metal orthoborate compounds (such as MBO_3 or $\text{M}_3(\text{BO}_3)_2$, M: earth alkali or rare earth metal) and their rare earth element ion-containing states are prepared and mixed in a short time, then heated at high temperature for 2 hours to obtain a powder product having pure and very small particle sizes

With the microwave assisted synthesis method in the invention, the heating time at high temperature was shortened from 12 hours to 2 hours and the formation of side (unwanted) products was also abolished.

In economical terms, a clean product that does not require purification is obtained in a short time, saving energy and time.



Structural, Energy Storing, Adaptive, Modular Elements



SESAME

The invention is for retrofitting buildings and for spreading the use of the renewable sources in dwellings.

Advantages

Use of Renewable Sources in Dwellings
Uninterrupted power generation is provided in the dwellings

Economical
Energy storage by means of concrete, known as one of the cheapest building materials, is very economical

Efficient
A more efficient system is achieved by using the available construction material, i.e. concrete, for also storing energy

Compatible with Building Architecture
Since the invention is also a reinforced concrete element, it is no different from any element in construction

Environmentally Friendly
Unlike lithium-ion batteries, SESAME could be used as a filling material in construction sites without the requirement for a special recycling process when battery life is over

It is possible to store energy from renewable energy sources

SESAME could be integrated into the frame system of new buildings or into the exterior frames of existing buildings by means of specially-designed connectors for the purpose of retrofitting and/or for the utilization of renewable energy sources in dwellings. The invention has a layered nature. In the innermost layer, a concrete layer resistant to high temperatures is placed for the storage of heat energy.

The use of the invention is to store energy from renewable energy sources for supplying energy when renewable energy source is not accessible. In addition, it could be utilized for retrofitting existing buildings with inadequate earthquake performance and for satisfying the necessary earthquake performance of new buildings.

The modular nature of SESAME allows the battery to be replaced when it is damaged or its life is over. In addition, it is also possible to integrate SESAME into the existing buildings by virtue of specially-designed connectors.



Solar Concentrator, Based on Horizontally Staggered Light Guide

Hor-Con Solar Panel

Solar cell having only one fortieth of the panel area can efficiently convert light into electrical energy.

Solar electricity with less cost

The invention relates to a waveguide for solar collectors and a solar collector employing such a waveguide to be used for concentrated solar power generation.

In this invention, a waveguide having an array of directing surfaces is developed, such that the waveguide and the array of directing surfaces lie on a plane nonparallel to the direction of incident light. Moreover, a solar collector having an array of concentrator cells and a waveguide lying on a plane nonparallel to the direction of solar radiation from said array of concentrator cells is developed.

Advantages

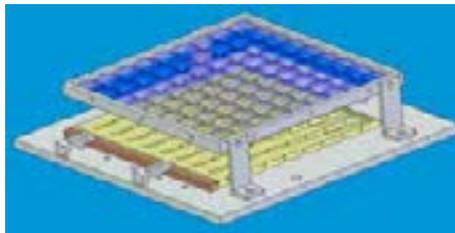
Low Cost

Passive cooling is sufficient even in hot climates despite concentration

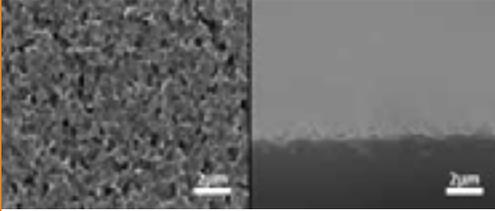
High recycling at the end of life

High capacity increase in the short term with the use of existing plastic and sheet production infrastructure

Ability to work with low cost tracking systems with wide acceptance angle



Nickel Assisted Single Step Etching of Silicon Wafers



Nickel Assisted Single Step Silicon Etching Process

Different than the other processes that use two step etching mechanism, this process can etch silicon via single step solution method.

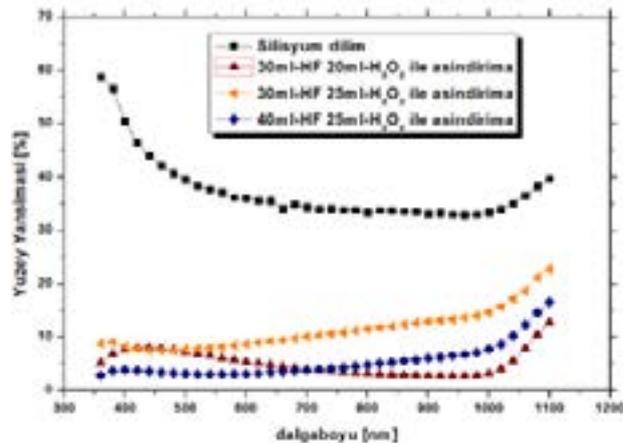
Advantages

- Single step etching
- Use of Ni, less expensive
- Low reflection
- Usable for diamond cut wafers
- Industrial applicability

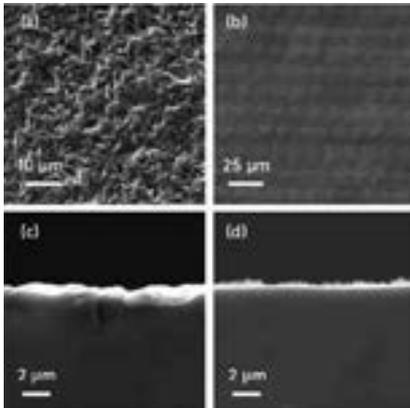
Desired reflection and surface roughness via Nickel assisted etching

Crystalline Silicon technology is the most widely used technology in photovoltaics throughout the world. This technology is composed of both mono-crystalline and multi-crystalline technologies. For both, light trapping and reflection are important parameters that affect the cell performance.

This invention aims a new and single step “Nickel assisted etching process” so that the reflection and process cost is minimized. In addition, solves the problems that occur for multi-c texturing.



Method of Surface Texturing Using a Laser Heating Step That Contributes to Small-Sized Texture Morphology



Laser-enabled Small Pyramids and Less Saw Damage Etch

A laser processing is applied before the texturing step to heal the saw damage region which also modifies the surface to obtain much smaller pyramids.

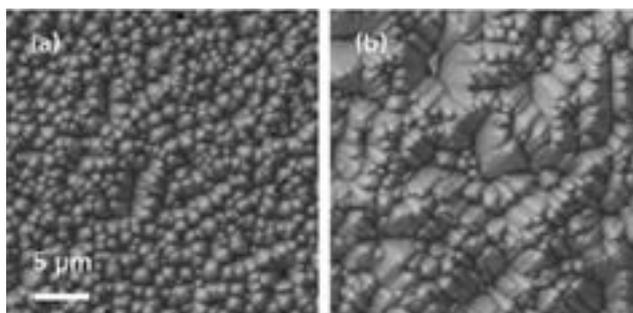
Advantages

- Smaller random pyramids
- Partial healing of the saw damaged region
- Especially suitable for ultrathin silicon wafers

Small pyramids and less saw damage etch

Currently, more than 85% of photovoltaics market is dominated by crystalline silicon solar cells. Silicon wafers are typically obtained from a silicon ingot which is then sliced into thin silicon wafers by method of wire sawing. The slicing and wire sawing processes create physical damage to the silicon such as high surface roughness and microcracks that penetrate up to 10 μm into the silicon. This top most layer of damage is called saw-damage region. To achieve high efficiency solar cells, a process of saw-damage removal is often required.

In the present invention, damages created in the process of wire sawing are removed without the need of chemical etching process. Instead, laser beam is scanned throughout the wafers to eliminate saw-damage region. Upright pyramids with controlled sizes are fabricated in the same laser scanning process.



A Neutron Detector with Solid-Liquid Moderators for Measuring Neutrons at Different Energy Ranges



Neutron Spectrometer with Variable Moderator

The most important innovation of the invention is that solid and liquid moderators can be controlled by robotic systems. Thus, variable moderator thickness is reached around the detector.

Advantages

Variable

The invention may vary so as to work efficiently in different applications

Innovative

It provides the user with the opportunity to change detector parameters with remote access

Practical

It provides great ease of use when its volume and weight are evaluated

It can be developed

It can be developed by the user using different materials in line with various needs

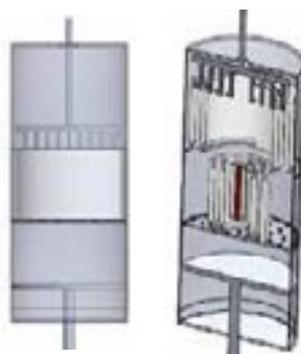
Wide Range of Usage

The usage range problem encountered in neutron detectors is solved thanks to variability

A user-adjustable moderator instead of a fixed-thickness moderator

The invention provides a user-adjustable moderator instead of a fixed-thickness moderator found in commercially used neutron detectors. Thus, in different radiation applications where neutrons are produced in different energies, the detector can be ensured to be sensitive to a different energy range in each moderator thickness. The limited working range, the most common problem in commercial neutron detectors, can be increased by changing the energy range to which the detector is sensitive.

The invention allows the user to change the detector parameters with remote access thanks to the mechanical and electronic design realized. In addition to automatic measurements such as the highest energy and average energy, the measurement ranges of the device can be changed by pre-programming the detector by the user or by intervention at the time of measurement.



Picture 1: Front View of the Detector. There is a Solid Moderator Chamber at the Top, a Measuring Chamber at the Middle and a Liquid Moderator Storage Chamber at the Bottom.

Picture 2: Side Section Image of the Detector. Rotating System Drops the User-Determined Solid Moderator into the Measuring Chamber.

Clean High-Yield Recycling Method of Polylactic Acid

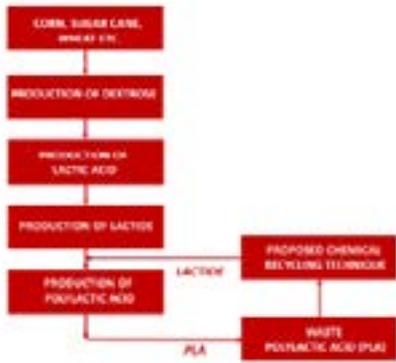


Figure 3. Polylactic Acid Production Cycle from Waste Polylactic Acid

High-Yield Green Recycling of Polylactic Acid

The invention provides high yield production of lactide, which is used as a raw material in polylactic acid production, from waste PLA in one step, without the necessity of the costly separation process. It also reduces the production cost of PLA by eliminating the production of lactic acid and conversion of lactic acid to lactide.

Advantages

Production of lactide from waste PLA in one step

High yield production of lactide

Requirement of no separation processes for the production of lactide in high purity

Shortening the production process of lactide from PLA

Shortening the PLA production process from waste PLA by eliminating all the process steps required for the production of lactide

The invention provides recycling of PLA in a batch reactor at low temperature, in short reaction time, without producing wastes or emissions

Polylactic acid (PLA) is an industrially produced, biodegradable polymer that is widely used in the market. PLA is commonly used in many medical applications due to its biodegradability and biocompatibility. In recent years, due to its mechanical and thermal properties, PLA replaces the commonly used traditional plastics.

The increasing demand for the polymer leads to an increase in its production capacity and a decrease in its production cost. However, the biodegradation of the polymer needs to be carried out in industrial composting facilities under certain conditions, which renders the biodegradation of PLA wastes ineffective and leads to the continuity of waste. With the proposed recycling technique, lactide, which is used as a raw material in the production of polylactic acid, can be produced from the waste polylactic acid with high yield and without waste generation. The direct recovery of lactide as the recycling product of PLA, eliminates the conversion step of lactic acid to lactide in the production of PLA.

This innovation provides the elimination of the negative impacts of biodegradable plastic wastes on the environment without creating further emissions or wastes while protecting water resources. Thus, it supports the development of sustainable plastic technologies.

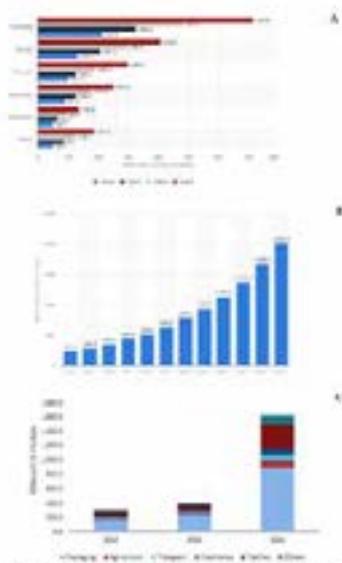


Figure 2. A) Market value (million of polylactic acid) in the United States from 2014 to 2022, by application (in million U.S. dollars); B) Market value of polylactic acid in the United States from 2014 to 2022 (in million U.S. dollars); C) Market value of polylactic acid in Europe from 2014 to 2022 (in million U.S. dollars)

Sinus Output Buck-Boost Inverter for Variable Frequency Variable-Voltage Applications



Sinus Output Buck-Boost Inverter

Operation at very low input voltages.
Sinus output voltage without a filter.
Suitable for variable frequency operation
Low cost.

Advantages

Even at very low input voltage levels the output voltage is kept at desired level

3-phase or single-phase variable frequency sinus output without filter

Low cost compared to existing circuits with similar function

Device protection under abnormal conditions

Isolated input and output stages

Extended range for electric cars when necessary.
Energy conversion, in wind and solar electric conversion systems, even at very low input voltages without an additional boost stage.
Lower cost than comparable circuits.

This device is a converter capable of converting DC voltage to 3-phase sinus output. It is composed of a power stage and a control stage. It is suitable for motor drives, solar and wind energy conversion systems and UPS systems and similar applications.

The power stage is composed of 3 “Non-Inverting Buck-Boost” converter, one for each phase.

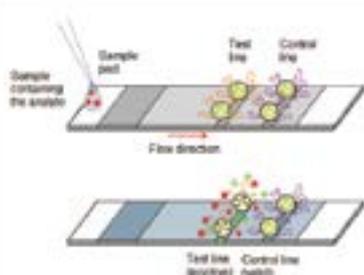
This converter is capable of buck-boost operation. Each phase of the converter has 4 switches. The switches are turned on or off depending on the operating mode. To prevent saturation of the inductances of the circuit Hall-Effect sensors are used to sense the current and control current level.

The control stage drives the power stage to produce variable-frequency, variable-voltage sinus output. Furthermore protects the circuit from over voltage or over current under abnormal conditions. The input voltage is measured and considering the reference value for the output, switching signals are controlled by the microprocessor. “CPLD” sends the appropriate signals to the power stage switches, using the signals from the inductor current measurements. In case of abnormal output voltage the microprocessor reduces output voltage. Input and output stages are isolated by optical links.

Separation of alcohol vapor from alcohol vapor and nitrogen mixtures by mixed matrix membranes

Recovery of high value volatile organic compounds by membranes

This invention is about the development of membranes with high flux and selectivity for the recovery of high value volatile organic compounds that have low concentrations in air or nitrogen. The membrane developed for the separation process is an elastomeric polymer and filled leaf-shaped microporous crystals.



Advantages

Very high VOC flux through the membranes

Very high VOC/nitrogen selectivity

Membranes allow the separation of VOCs from gas mixtures with very low concentrations of VOCs.

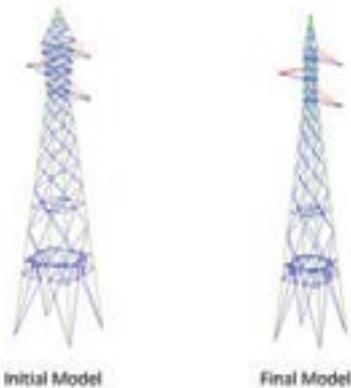
Increased concentration of VOC after membrane separation increases the condensation temperature significantly so that the VOC recovery process will be more efficient.

The developed membranes can be used before or after the adsorption cycle in the solvent recovery process.

the VOC recovery process is more efficient and economic

Membranes are semi permeable materials that allow the permeation of some molecules while reject the others. The membrane based separation processes are economical, energy efficient and can be easily scaled-up, which are the major advantages over the other separation processes. In this invention, polyether block amide membranes were produced. The flux through and selectivity of membranes were substantially improved by incorporating ZIF-L type microporous materials in to the membrane formulation. Owing to the high flux and selectivity of membranes, the concentration and condensation temperature of the permeated volatile organic compounds is increased. This provides that the condensation step that takes place in the VOC recovery process can be performed at temperature higher than cryogenic conditions, hence the VOC recovery process can be more efficient and economic.

CAD Integrated Size and Shape Optimization of Steel Lattice Energy Transmission Line Towers Using Simulated Annealing



Size and Shape Optimization of Energy Transmission Line Towers

This invention focuses on preventing design error/mistakes of energy transmission line towers sourced by human-being and automation weight optimization which is one of the most important goals of energy transmission line tower design process.

Advantages

Efficient: To reach better results compared to classical structural optimization and design techniques.

Useful: The invention can be used in both academic and practical engineering applications.

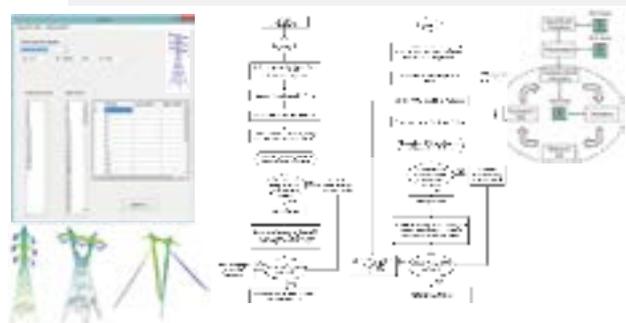
Fast: Achieving results faster than conventional structural optimization techniques.

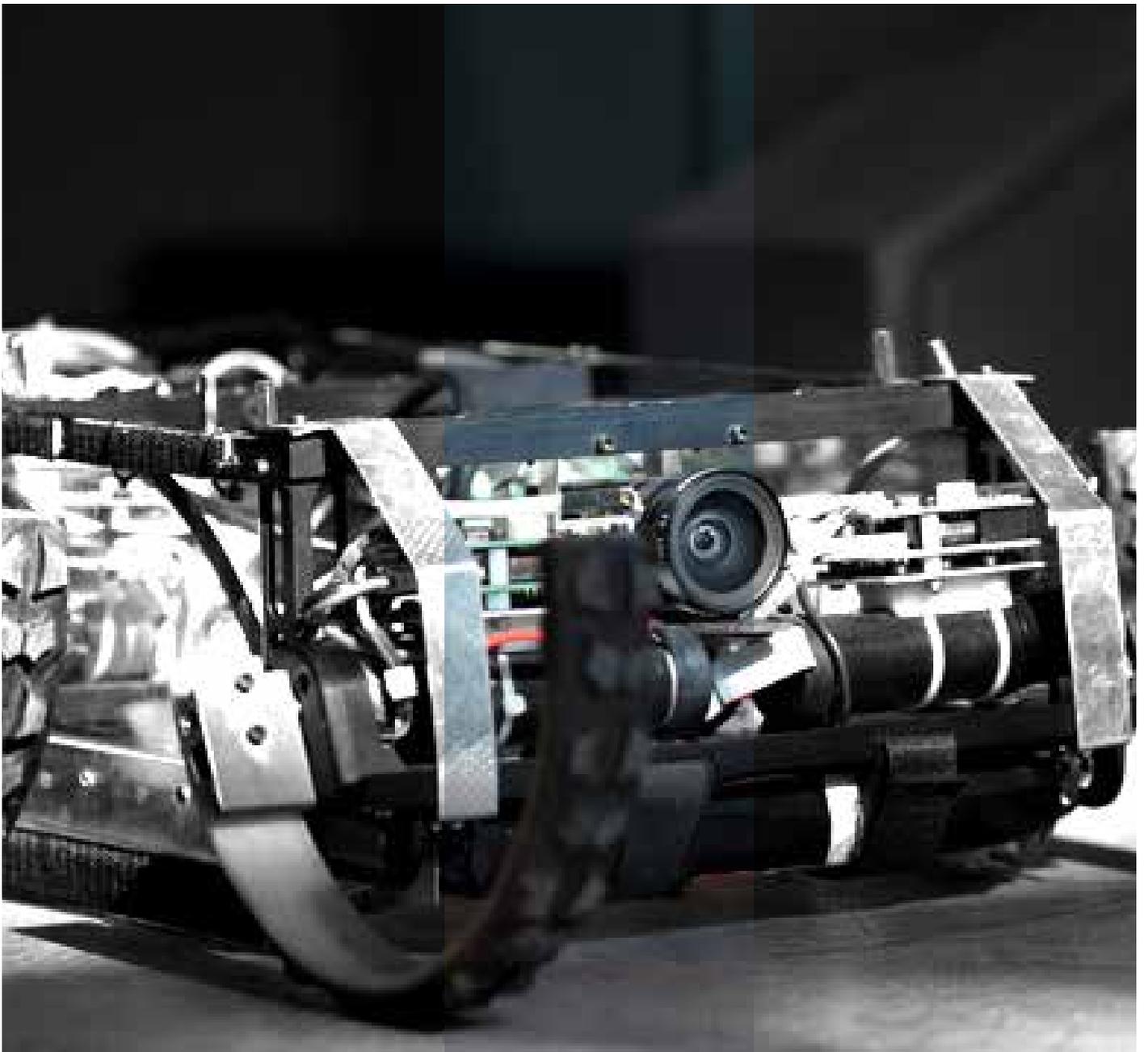
High performance: Achieving global optimum results without getting stuck with local optimum ones.

Sensitive: Ability to reach practical engineering results with higher precision than the results obtained with conventional structural optimization techniques.

The most prominent purpose of the energy transmission line towers at the design stage is to design a cost-effective structure providing the strength and the displacement constraints defined by the specifications. This purpose is provided effectively and in a reasonable time period accepted in design offices by this invention.

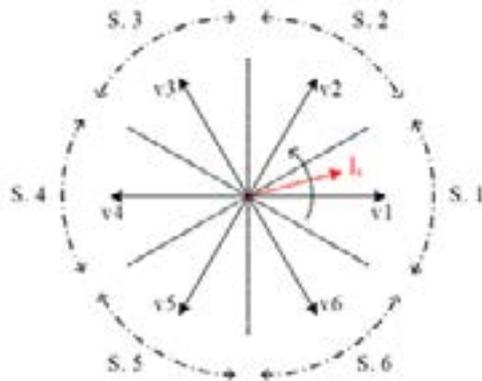
The purpose of the structural design is to obtain a cost-effective structure providing the strength and the displacement constraints specified by the specifications. This corresponds exactly to the general definition of the optimization problem. For this purpose, after a standard structural design problem is transformed into a mathematical optimization problem, the optimum solution is obtained by using an appropriate optimization technique. With this invention, the optimization technique suitable for energy transmission line towers has been developed and made usable in practical life.





Machinery and Manufacturing

Algorithm That Reduces The Prediction Vectors for Model Predictive Control of Alternating Current Motors



An algorithm to reduce the computational burden of MPC

It reduces the computational burden of the MPC of alternating current machines by decreasing the set of prediction vectors. Besides, it offers switching loss reduction to the inverter that the technique has been applied on.

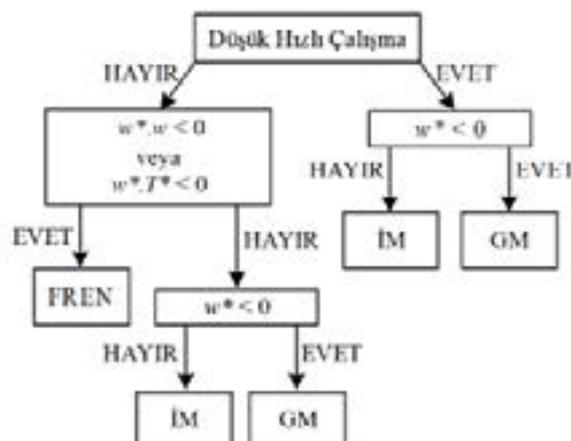
Advantages

- Reduction in computational burden
- Enabling long horizon control applications due to the reduction in computation burden
- Efficiency increase due to switching loss reduction
- Enabling the size reduction of the heat-sink due to the increase in efficiency

To obtain a reduction in computational burden and switching losses

In the classical sense of MPC of alternating motor drives, all of the vectors that the inverter can produce are evaluated and the optimum vector is applied. Our new algorithm discards some of the vectors without the need of evaluating them, foreseeing that those vectors would turn out to be non-optimal. Thus, reduction in the computational burden is achieved without sacrificing the dynamic performance of the motor drive.

Besides, with the observations done on stator current and a careful selection of the zero vectors, reduction in the switching losses of the motor driving inverter is achieved with the degree of reduction depending on the motor drive scenario. Thus, efficiency is increased for the motor drive inverter.



Installation and Water Disposal Free Air Conditioner Located Around the Lower Door Region



Installation-Free Portable Door Air Conditioner

The invention has the advantage of no installation need; it is only slipped under any door and grab the door from both sides with its U shape. The compressor unit, which is the noisy part, remains at the outer side of the room and the air blowing part is kept inside the room, providing a silent environment with the desired temperature.

Advantages

Due to its wheeled design and in-existent need of installment, it can be moved easily to any desired area

It is enough to place it by slipping under any door without any need of installation

Because of its non-existing need of water disposal unlike its mobile rivals, this design is user friendly

Its attached design to the door looks better

It provides efficient use of area with its placement in the dead space around the door

Mobile, silent, user friendly, installation-free

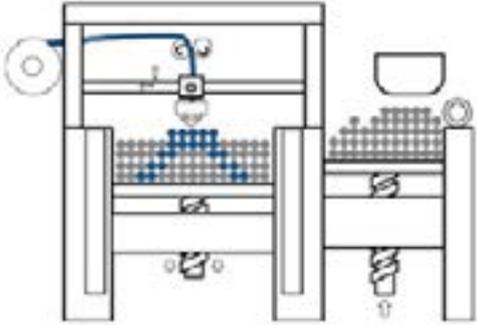
The design works with the same heating / cooling principle of conventional ACs but differs in the path which condensed water follows. In the other designs, condensed water disposed from the system where it is evaporated on the compressor in this AC.

Compressor part of the conventional ACs are located outside the building, therefore preventing voices coming in. However, this design separates these two parts with a U shape positioning and locates the door between those two parts.

The air outflow region is in the room where the noisy compressor part remains outer of the room, providing a silent air conditioning. As there is no damage or modification on the door, the AC unit can be removed by scrolling whenever it is desired.



Fused Filament Fabrication Method on a Powder Bed



Easy Additive Manufacturing of Intricate Support-Free Structures

The working principle of the invention is based on the fused filament fabrication process amendment by making it on a powder bed

Fused filament fabrication based additive manufacturing

The proposed fabrication method eliminates the need for the support structure for intricate shapes owing to its inherent process characteristics. The production quality and costs are reduced for difficult parts such as lattice structures. The invention contributes to the global sustainability with the use of harmless recyclable materials.

The invention offers a simple solution for the problematic and costly support structures in fused filament fabrication based additive manufacturing. It provides the easy production of durable objects with reduced cost.

Advantages

Ease of production

Process advantage for intricate structures

Cost

Low production cost due to the elimination of supports

Durability

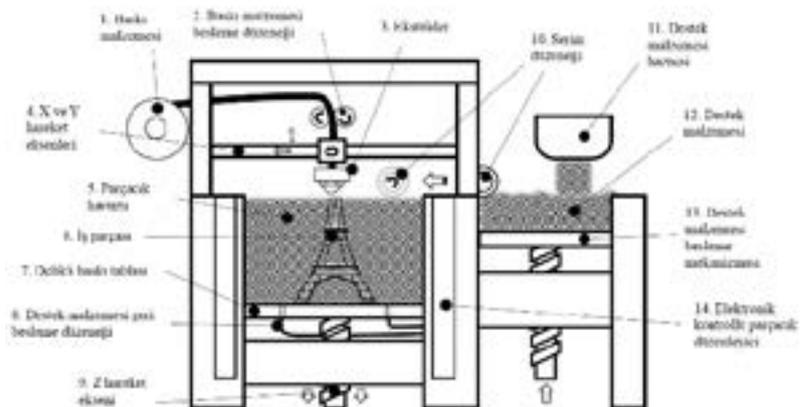
Production of more durable products due to homogeneous cooling environment

Sustainability

Advantage of use of recyclable materials

Environmentally friendly

Use of materials harmless to humans and the nature



Rotary Drum for Microwave Ovens



Equal Distribution of Heat on Food

In microwave ovens, where food is heated and cooked using microwave energy, rotary drum technology has been developed that allows the food to be heated and cooked in equal amounts on each side using the principle of mixing food inside.

Advantages

- Equal amount of heat distribution
- High efficiency
- Energy-saving
- Applicability to each microwave oven

More efficient heating is possible in a shorter time

Thanks to the technology developed by the invention, the rotary drum for microwave ovens can be rotated around both the main shaft and its own axis to move the food in each of the three dimensions. Thus, besides turning the food in the angular dimension, it also mixes itself with the rotation of the drum around its axis. With the help of this process in three dimensions, every side of the food can be exposed to the same amount of microwave energy. Because the food is exposed to equal amounts of microwave energy on all sides, the intensity of the microwave energy to be dispensed onto the food can be low and in this case the time required for food molecules heated by microwave energy to be distributed among themselves is achieved.

It is also possible to utilize the maximum volume of the internal volume of the microwave ovens by using more than one drum, so that the optimum amount of food can be processed at the same time.



Three Dimensional Mixer for Microwave Ovens



Equal Distribution of Heat on Food

In microwave ovens, where food is heated and cooked using microwave energy, three dimensional mixer has been developed that allows the food to be heated and cooked in equal amounts on each side using the principle of mixing food inside.

Advantages

Equal amount of heat distribution

High efficiency

Energy-saving

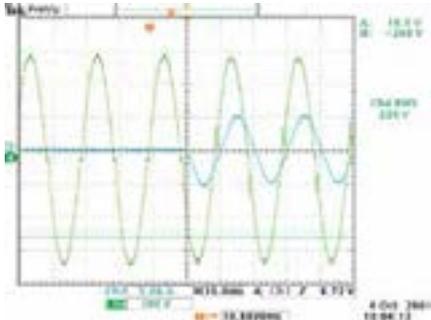
More efficient heating is possible in a shorter time

The three-dimensional mixer developed in the present invention is housed in a specially designed mid-sized glass container, and thanks to the wall strippers, the wings and the bottom strippers, the food contained in the container during the operation of the microwave oven is mixed in three dimensions: diameter, height and circularity. Thus, the heat reaches equal amounts on every side of the food and the heat transfer between the molecules can be sufficient for a homogenous heating.

By ensuring that the food is exposed to equal amounts of microwave energy on all sides, the deterioration that can occur in certain parts of the food is prevented.



Suitable for Uninterruptible Power Supplies and Motor Drives



Single-Phase Or Three-Phase Sinus Output Inverter

The new technology requires less space and has superior properties with low harmonic distortion sinus output voltage.

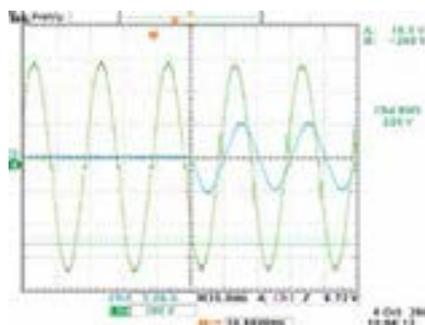
Advantages

- Sinusoidal voltage output
- Single-phase or three-phase output
- Does not require output filter
- Less than 3% total harmonic distortion
- Rated output voltage even at low input voltage
- High efficiency electronic circuit
- Smaller volume than comparable topologies

Rated output even at low mains voltage

In present technology, uninterruptible power supplies and motor drives have an output filter which filters the PWM modulated output voltage of the inverter to obtain a sinusoidal output. As a consequence additional space is needed and the circuit efficiency is lowered. Over modulation techniques are used to obtain rated output at low input voltages. In such circumstances, output voltage distortion increases, the voltage drop on the filter further increases the lowest voltage at which rated output voltage can be obtained.

In the new technique,; there is no need for an additional filter to obtain sinus output. In this technology even if the input voltage drops below 20% of its rated value, sinusoidal output voltage at desired voltage level can be obtained.



Internal Heating System for Forging Dies

Short Preheating Process

The invention relates to a die heating system that is developed for preheating and continuous heating of forging dies internally.

Long die life, and mass production performance

The present invention discloses an internal heating system for forging dies by using electrical cartridge heaters placed inside the channels drilled at feasible locations relative to the die cavity. The system is automated to preheat the forging die and control the temperature of the die during the forging process.

The system is used for hot, warm or cold forging of steel, aluminum, copper, titanium alloys or any other metal forged in forging industry.

Advantages

Eliminates, reduces thermal fatigue , operational time losses, combustion gasses

Obtains operational ease and convenience

Applies heating energy directly to the forging dies

Eliminates decarburization, surface wear, on forging die surfaces

Increases the uniformity of the temperature distribution on dies



Bilateral Operating Suspension



Symmetric Suspension Performance in Bidirectional Loading

The invention offers to dampen bidirectional forces and vibration by using a simpler mechanism, using a single piston/spring pair with the same performance.

Advantages

Bilateral

New suspension can dampen bilateral forces and vibration

Compact

Invention provides solution in a smaller volume than conventional design

Simple

Invention has a simpler design relative to a classic solution

Scalable

Application areas can vary from robots to big electric vehicles

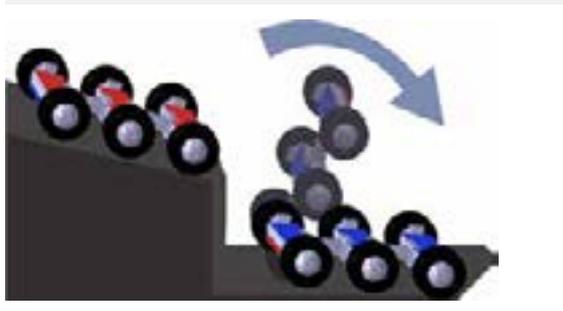
Cost effective

New suspension brings in a cheaper solution to the requirements

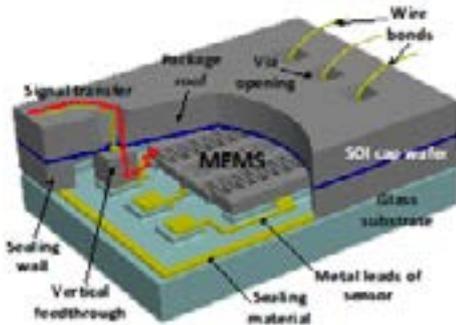
A compact suspension system that can dampen bidirectional forces and vibration with the same performance

Some vehicles and robots need suspension which can provide symmetric performance regardless of vehicle's orientation (upside down or not). Also, when encountered with a deep hole, conventional suspensions stay in their elongated state and cease to perform their functions. New suspension design is useful in solving these kinds of problems. Especially, for vehicles that use electric hub motors, this invention provides a compact solution with symmetric damping performance.

Main principle of invention is to compress a piston/spring couple in either direction of motion along the suspension stroke axis. In order to achieve this, both ends of spring/piston couple are freed to move along the stroke axis on slider mechanism and couple is limited by suspension connection end plates.



Method of Wafer Level Hermetic Packaging with Vertical Feedthroughs



Hermetically Packaged Microstructures

Hermetic packaging of microstructures fabricated by using the MEMS technology under a controlled atmosphere and transfer of microstructure leads to outside of the package without degrading the hermeticity.

Advantages

Wafer-level-packaging

Packaging of all microstructures at the same step

Hermetic

Packaging of microstructures under desired environmental conditions

Vertical-feedthroughs

Leads of the microstructures are vertically transferred to the outside of the package

Low cost

Reduced process steps compared to the other techniques in the literature

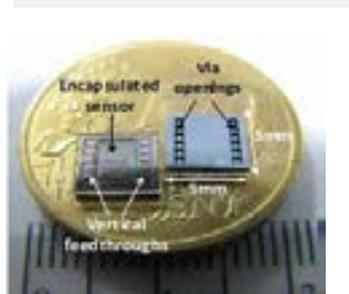
Compatibility

Packaging with or without any sealing material at low or moderate temperatures

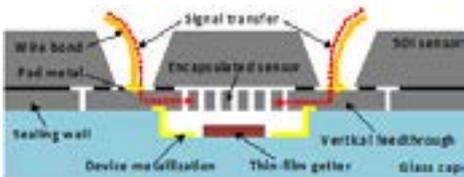
Hermetic packaging of all microstructures on the same wafer

Wafer level packaging of microstructures increases the fabrication yield, decreases the package size as well as the cost and as a result they become useful in a wide range of applications.

In this invention, a sensor wafer is bonded to the cap wafer by using silicon-metal based alloys or silicon-glass anodic bonding techniques for the hermetic packaging of microstructures. The formation of vertical feedthroughs are formed on the cap wafer without any need for complex drilling/filling process steps different than the other techniques in the literature. This method is applicable to the other type of sensor wafers fabricated with various process flows.



Hermetic Packaging Method for SOI-MEMS Devices with Vertical Feedthroughs



Hermetically Packaged SOI-MEMS Devices

Hermetic packaging of MEMS devices with vertical feedthroughs on an SOI wafer at the same step.

Advantages

Wafer-level-packaging

Packaging of all microstructures on an SOI wafer at the same step

Hermetic

Packaging of microstructures under desired environmental conditions

Vertical-feedthroughs

Leads of the microstructures formed on the same SOI wafer with microstructures are vertically transferred to the outside of the package

Low cost

Reduced material usage and process steps compared to the other techniques in the literature

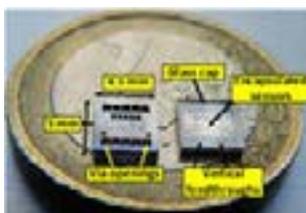
Compatibility

Packaging with or without any sealing material at low or moderate temperatures

Hermetic packaging of microstructures which are formed on the same SOI wafer with the vertical feedthroughs

Wafer level packaging of microstructures increases the fabrication yield, decreases the package size as well as the cost and as a result they become useful in a wide range of applications. In this invention, an SOI wafer containing both microstructures and vertical feedthroughs is bonded to a cap wafer by using silicon-metal based alloys or silicon-glass anodic bonding techniques for the hermetic packaging of microstructures.

The formation of vertical feedthroughs on the same SOI wafer with the microstructures without requiring any complex drilling/filling process allows this hermetic packaging method to be done with reduced material usage and process steps compared to the other methods in the literature.



Multi-Directional Torsional Hysteretic Damper



Anti-Seismic Devices Against Earthquakes

The invention relates to seismic resistant devices and in particular, to seismic hysteretic dampers, used to protect the structures against severe earthquake shakings.

Advantages

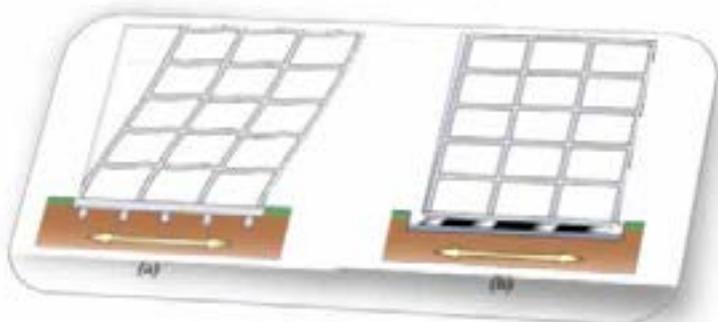
- Safe
- Economical
- Longer lifetime
- Simple set up
- Durable

Safety during an earthquake

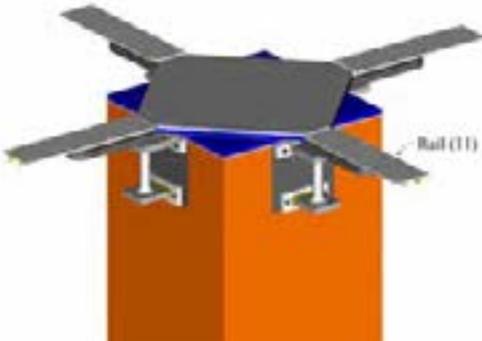
The invention develops a multidirectional hysteretic damper better, or as effective in behavior as the available hysteretic dampers and more economical to manufacture.

Although the use of cylindrical steel cores as hysteretic damping elements is a known technique, the design through which they are assembled into a multi-directional hysteretic damper is the new and unique feature of the invention.

The seismic resistant devices used in the invention are installed at points where large displacements is expected due to earthquake shakings.



MARTI



Multi-Directional Adaptive Torsional Isolator

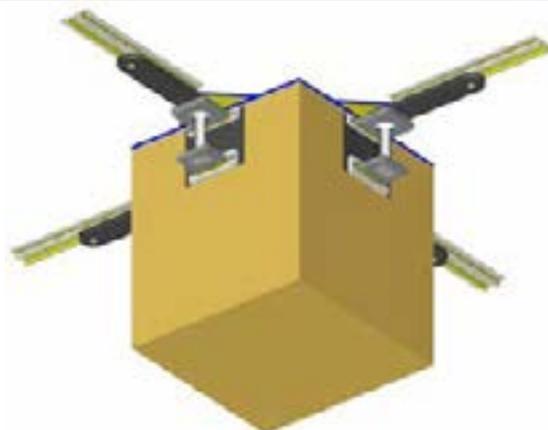
The invention is related to a multidirectional adaptive re-centering torsion isolator that is used for isolating buildings, tanks and bridges from earthquakes.

Advantages

- Safe
- Economical
- Longer lifetime
- Simple set up
- Durable

The performance is independent of environmental factors

The invention is related to a multidirectional adaptive re-centering torsion isolator that is used for isolating buildings, tanks and bridges from earthquakes. The multidirectional adaptive re-centering torsion isolator comprises a flat articulated slider and four or more cylindrical energy dissipaters. The flat articulated slider positioned on top of the column provides vertical load transmission, low friction and horizontal displacement capacity. The cylindrical energy dissipaters provide displacement, re-centering and damping in any of the horizontal directions.



Access System for Disabled / STAIRCASE



Mobility for Disabled People on the Stairs

The invention is about an access system for disabled persons who are blind or using wheel chairs or crutches, in order to help them to navigate between elevation differences.

Advantages

Ease of use and simple set up

Economical

Safe

Suitable for mass production

Applicable to all kinds of structures

A mobile system that can easily be installed

The invention relates to an access system for disabled that is installed upon a staircase when an appropriate place can not be found for a ramp to enable the disabled people to move between levels of ground with height differences , without eliminating the function of staircase.

The access system for disabled developed with this invention can be applied in two ways: with a sloped platform and with stairsteps. This system for disabled installed on the staircase turns into one that can conveniently be used partially or completely by both the disabled and able.



Access System for Disabled / RAMP

Easy to Move Between Lower and Upper Levels of Ground with Height Differences

The invention is about an access system for disabled persons who are blind or using wheel chairs or crutches, in order to help them to navigate between elevation differences.

Applicable solutions for disabled people

The invention is about an access system for disabled persons who are blind or using wheelchairs or crutches, in order to help them to navigate between elevation differences. System has a moving platform to get up the higher level or down the lower level.

The system developed provides a solution which can be used only as a ramp when needed, can reduce the slope of the platform for the comfort and the safety of the disabled person and can be run with hydrolic or mechanic systems and with electricity.

Advantages

Ease of use and simple set up

Economical

Safe

Suitable for mass production

Applicable to all kinds of structures



Access System for Disabled / VEHICLES



Ease of Access to Vehicles

The invention relates to an access system that enables the disabled using a wheelchair to access elevations with boarding levels higher than ground level, which they can not reach without external help.

Advantages

- Ease of use and simple set up
- Economical
- Safe
- Suitable for mass production

Wheelchair users can easily board the vehicle

The invention developed a system which enables the elevation of the platform upon which the wheelchair and its user are placed so that the wheelchair user can reach the internal cabin of the motor vehicle.

It is a lift system which can be used with any linear actuator with the application of vertical force to the lifting systems and which can be installed onto big or small motor vehicles. It does not require frequent maintenance owing to its simple structure, which is durable under unexpected loads, and which has a low initial installation cost.



Welding Process Control System with Fiber Bragg Grating-Based Optical Sensors



The Continuity of Quality Control in Manual Sources is Possible

The invention relates to the estimation and / or control of the source quality of the time-dependent position (position) information received using a fiber bragg grid-based optical sensor system coupled to the welding torch.

Advantages

High sensitivity

Lower cost

Real-time control

Continuous monitoring of position and speed is possible

Welding at the right position and at the right speed with instant feedback

With the proposed system, a more accurate correlation is established for the welding quality estimation, taking into consideration the welding operation parameters as well as the location of the torch relative to the work piece.

In addition to the source parameter set-up, fibers with fiber bragg grating are placed directly on the cable of the welding torch. Thus, it is possible to determine in real time the position of the welding torch in relation to the workpiece to be welded.

The position information of the welding torch and the parameter records taken during the welding operation are compared with a database containing the parameters and torch position information to be prepared by welding tests. According to the results obtained, it is foreseen to increase the quality of the resource by controlling the quality of the resource or directing the operator.



A Surface Roughness Measurement Method and Setup

A Solution for Industry Applications Which Needs High Precision and Accuracy

This invention is related to a method and setup for measuring surface roughness and waviness.

It can be used in machines of different sizes ranging from micro machines to large machines

Measurement of surface roughness and waviness of surfaces is an important issue especially in different industry applications which needs high precision and accuracy. Therefore, numerous methods and setups have been developed for measuring surface roughness.

This invention is related to a method and setup for measuring surface roughness and waviness. In this technology, a surface to be analyzed and an interferometer interacting with said surface, being displaced relative to each other are used. Using the interference fringes obtained during the displacement along a particular direction (this particular direction is named as direction in this document after this point), the surface profile of the surface along the projection of the direction of progress is determined.

Advantages

- Accurate measurement
- Adaptable for micro machines
- Less cost
- Adjustable distance
- Easy to apply

A Three Axis Capacitive MEMS Accelerometer on a Single Substrate



Fabrication of a self packaged three axis a capacitive MEMS accelerometer

A three axis accelerometer design and fabrication approach are introduced, where the working principle and performance of each axis accelerometers are same. As a result, a tactical grade level three axis accelerometer could be fabricated with this invention.

Advantages

A high performance vertical axis accelerometer design is introduced where its working principle is based on the high performance lateral ones

Fabrication of this vertical axis accelerometer is implemented to the lateral ones without requirement of additional fabrication steps

As a result of this implementation, a high performance three axis accelerometer with same performance parameters on each axis could be fabricated

Those accelerometers are fabricated with a packaging layer without an additional fabrication step

Dimension of the three axis accelerometer is minimized with a higher and equal performance results at each measurement axis

A vertical axis capacitive MEMS accelerometer design where its working principle is same as the ones used for lateral axis accelerometers

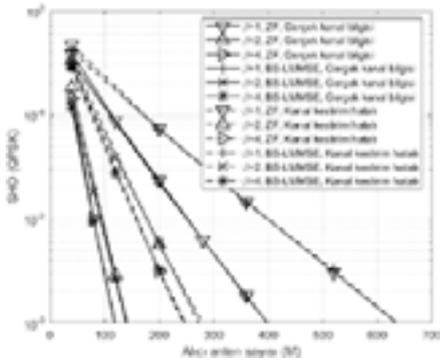
The main problem of the current three axis accelerometers where both military and commercial usage of them exists, is not having same performance parameters in each axis, especially compared to the lateral and vertical ones. The main reason is that, working principle of existing vertical axis accelerometers are not based on differential sensing principle which is the case for high performance lateral axis accelerometer.

Current fabrication approach of vertical axis accelerometers is not based on differential sensing principle. Although, there exist several vertical axis accelerometer designs that are based on differential sensing, either they suffer from complicated fabrication processes or problems related to implementation of those vertical accelerometer design fabrication processes to the lateral ones.

All problems mentioned above are eliminated with this invention and implementation of its fabrication process to the lateral ones to have a three axis accelerometer.



Quantized Detection in Uplink MIMO with Oversampling



Smart Oversampling Scheme for High Quality Communication

The invention takes samples with a sampling rate which is faster than the symbol rate in time and processes those samples with a near-optimal linear signal processing technique.

Advantages

Connectivity

Users can stay connected over wider regions

High performance

Higher data rate experience

High efficiency

Higher data rates provided with smaller transmission bandwidth

Low cost

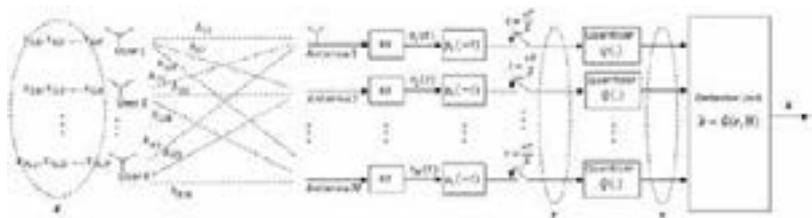
Higher quality of service with low-cost base stations

Stable

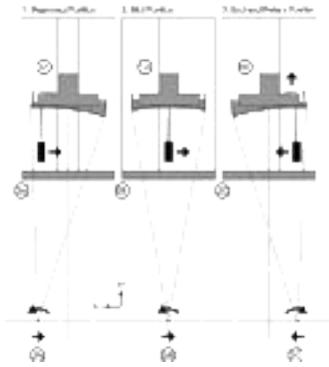
More stable connectivity due to the increase in the number of users that can be served

Enables higher quality communication with feasible/low cost massive MIMO base stations

This invention reduces the necessary number of antennas in new generation low-cost massive MIMO base stations to maintain a certain level of service quality, while providing significant advantages regarding data rate, spectral efficiency, coverage area, and the number of users that can be served by the base station.



Low-stress Stereolithography



Fast and efficient additive manufacturing method

This invention aims to solve the main problems of top-down SLA printers that are currently in the market; the sticky resin tank bottom and up and down movements of the print platform to solve resin flow and separation of model from the resin tank. This method enables a fast and efficient method to continue printing without unnecessary movements while creating a low-stress separation of model and resin tank.

Advantages

The speed gains provided by the tank motion,

The elimination of high forces during layer separation from resin tank,

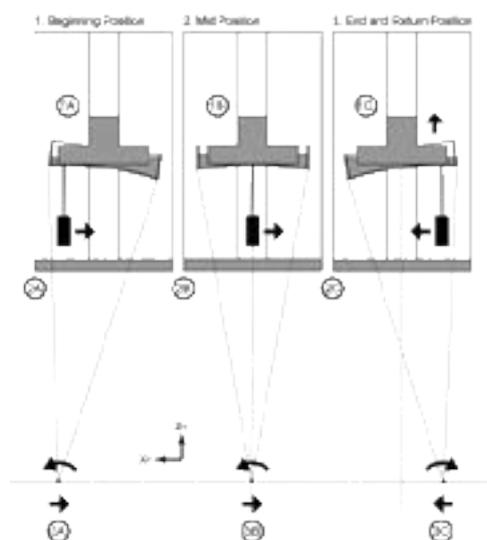
The continuous rocking movement of the resin tank prevents the particles in the resin to separate,

Eliminates the up-down movements for layer separation of the current state of technology,

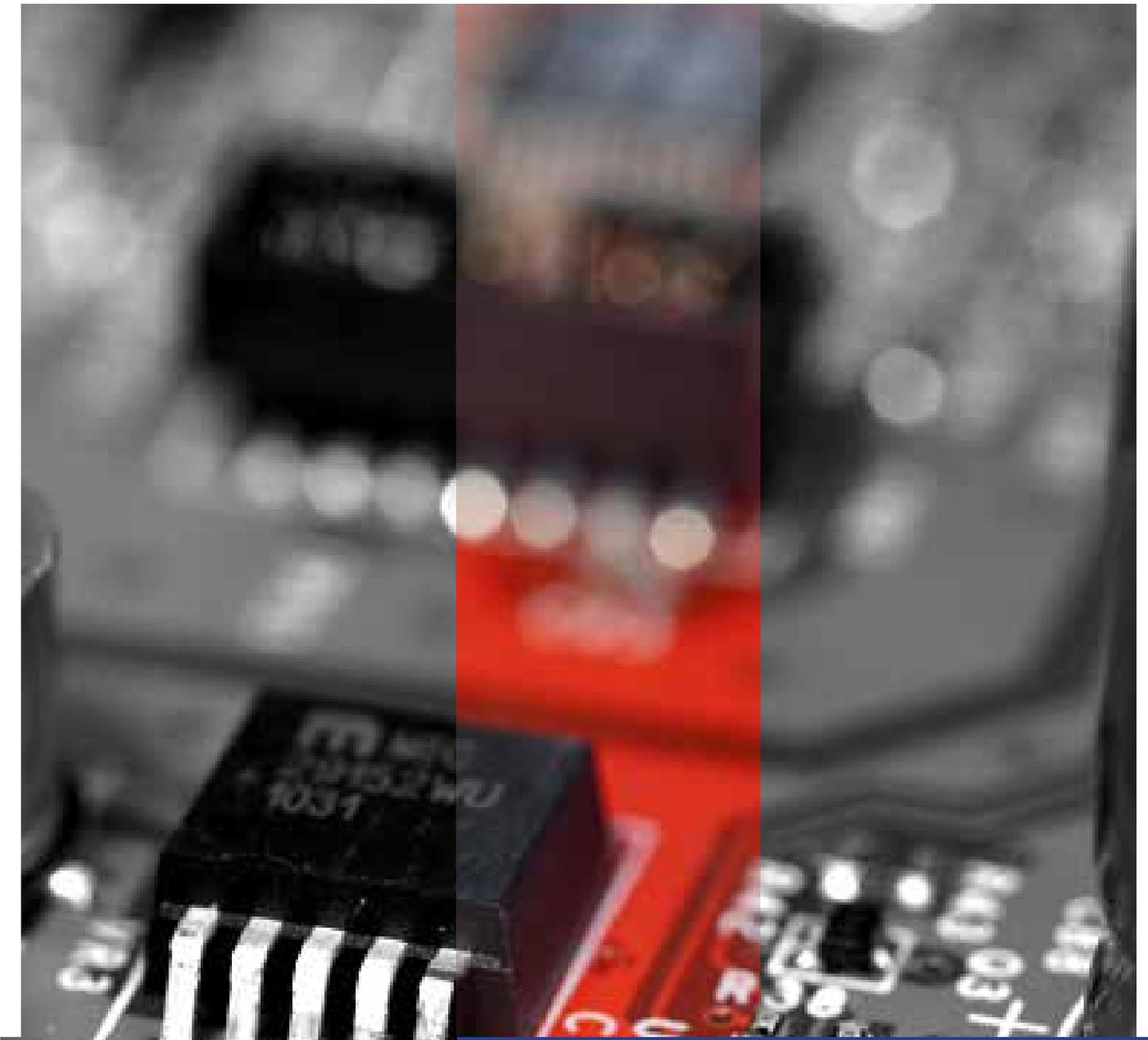
Prevents the formation of air bubbles from forming inside the resin as the build platform never exists the resin.

The main solution that the invention provides is enabled with a rocking resin tank that prevents the solidified polymer from sticking to the bottom of the tank. This also prevents unnecessary movements of the printer while enabling a continues printing experience.

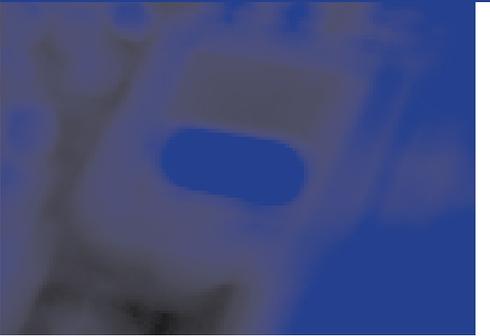
The rocking motion of the resin tank enables the solidified resin to separate from the resin tank bottom using a peeling action. This peeling action is only at the location of the solidified line by the laser thus not the whole surface. Currently, methods of top-down SLA use a flexible resin tank bottom that puts a great amount of pressure while the solidified resin separates and this creates failures and unnecessary time-losses during printing.



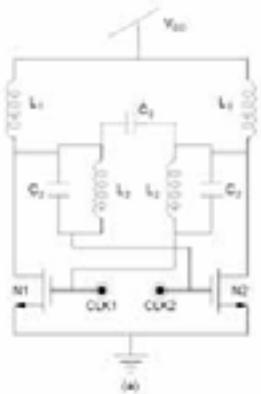




ICT



Fully Integrated Voltage Quadrupling And Low Phase Noise Oscillator for Ultra Low Voltage Applications



Oscillator Circuit for Ultra-Low Voltage Systems with Reduced Energy Consumption

The invention contains an original integrated circuit topology which can self-start using ultra-low input voltage levels, and step-up the input voltage at least four times to generate differential sinusoidal signals with low phase noise.

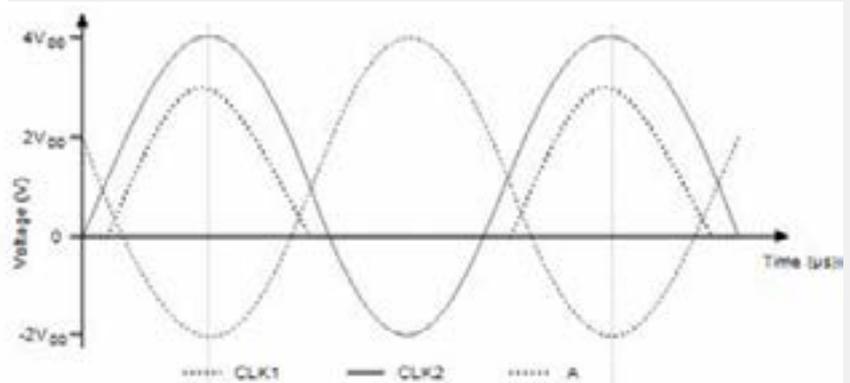
Advantages

- Self-starting with low input voltage
- 4x voltage step-up
- Low phase-noise
- Low cost and profile
- High integrated power capacity

Topology that makes the oscillator circuit work with ultra-low input voltage levels

The invention integrates a secondary LC tank oscillator to a standard LC tank using minimum number of circuit components. Thus, it steps up a low (DC) input voltage four times or more to generate differential sinusoidal signals with lower cost, lower input voltage, and lower phase-noise compared to alternative circuit solutions.

The invention provides a topology that enables Voltage Controlled Oscillator or simply Oscillator circuit, which is one of the building blocks of communication and power electronics systems, to work with ultra-low input voltage levels. It offers a low-cost and low phase-noise circuit solution especially to mobile electronic products with low energy requirement.



An Object Based Segmentation Method

Easy and Automatic Detection of Object Borders

The invention is related to a method that enables object based segmentation of especially air/satellite photographs that are viewed in high resolution.

Not the regions but objects are segmented

The aim of the invention is to be able to determine the borders and outlines of objects automatically with the usage of statistical, spatial and structural features/relationships and with the usage of high resolution air/satellite image data.

Another aim of the invention is to develop a method which enables to define the object as a whole instead of just a pixel and which can operate and work by being minimally affected by restricting elements such as ambient light, air conditions and resolution.

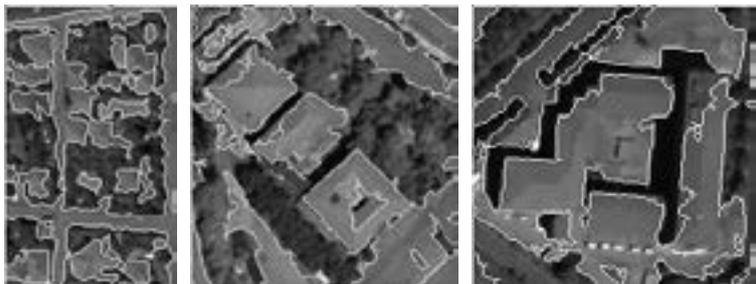
Advantages

Automatic

Fast

Repetable

Can be used for other applicaitons related to satellite image processing



Cloud Content Sharing and Interaction Box



An innovative solution providing portable, scalable, definable and secure learning cloud

A breakthrough invention enabling various organizations in the field of education, health, architecture, engineering, marketing and conference business to share their content instantaneously at minimum cost.

Advantages

- Secure file sharing
- Simultaneous training and presentation
- Personalised content and file sharing
- Interoperability
- Unified solution

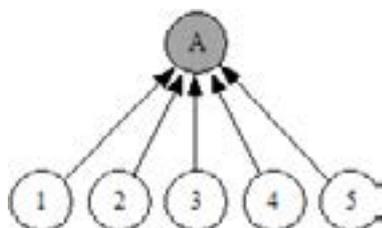
Enabling offline creation of customisable content and platform-independent sharing

Basic problems of in-class educational technologic are; dependency on a platform difficulties in knowledge sharing (multimedia diversity), efficiency and expertise problems in e-content in contrast to high demand, sustainability and quality problems based on lack of academic personnel with sufficient technical skills and difficulty in adaptation of the students, manageability difficulties of created content and learning environment, and inability of content creation due to technologic constraints.

Content sharing platform has the following features are in the scope of standards and specific scenarios, it can communicate with the peripheral devices connected to the network that it hosts via multiple protocols including USB, Bluetooth, Zigbee, DICOM, HL7 or IEEE 802.3 and 802.11.



An Energy Efficient Scheduling Method and Algorithm for Nondeterministic Traffic in IEEE 802.15.4e Time Slotted Channel Hopping (TSCH) Medium Access Control



Long Battery Life Network Device for Industrial IoT Systems

This invention introduces a scheduling method for low rate, heterogeneous and low latency traffic networks while minimizing the energy consumption and thus extending the battery life of the device.

Advantages

Adaptability

Adaptability to the industrial IoT standards and capability of parallel working with other solutions

Low complexity

Since the estimations are based on a heuristic approach, the computational power is very low

Energy efficiency

The device finds the most energy efficient solution possible and thus maximizes its battery life

Self-adaptability

Model is updated according to the environmental factors

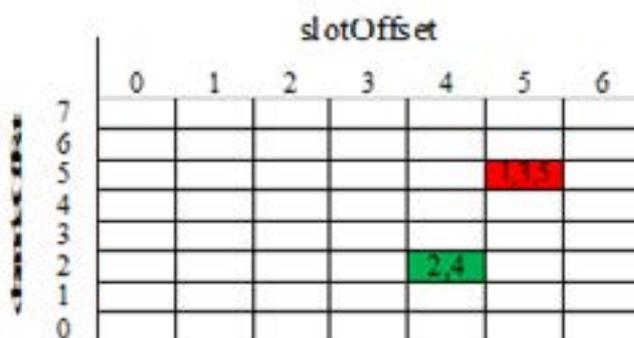
Scalability

Since the algorithm works in a distributed manner, performance is high even in networks with large number of devices

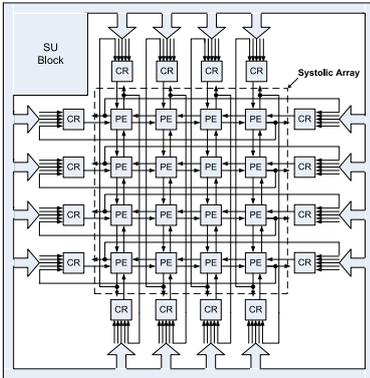
A network device which can be adjusted by the user

The proposed device in the invention works in accordance with the IEEE 802.15.4e TSCH operation mode. Scheduling method used by the device is based on a heuristic model and device is capable of estimating performance through this model. Moreover, the model is updated according to the current measurements.

Algorithm adopted by the device realizes the network configuration that complies with the latency and reliability constraints while providing minimum energy consumption using the estimation model.



Systolic Array Architecture for Fast IP Lookup



High Throughput IP Lookup Engine

Lookup engine provides much higher throughput than existing architectures with increased parallelism and is suitable for any type of tree structure for both IPv4/v6 schemes.

Advantages

High speed

Tbps throughput rate is achieved

Low delay

The average search delay is about 7ns per packet

IPv6 support

Any prefix tree in IPv6 can be mapped on the architecture

Modular extensibility

The number of PEs can be increased for more performance

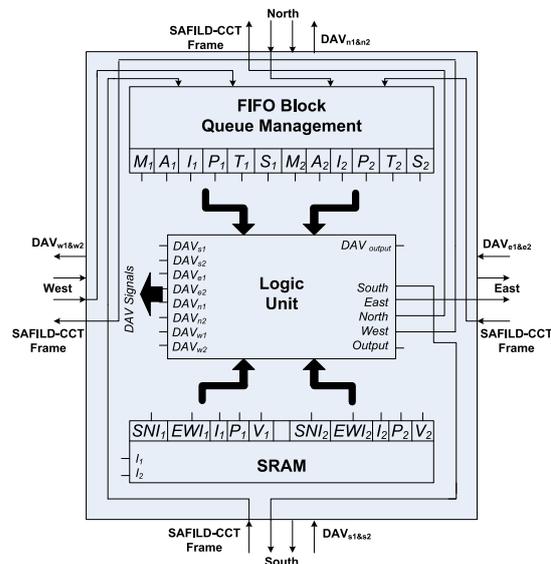
Fast updates

Supports incremental routing table updates

Achieves fast IP packet processing in core routers

SRAM-based systolic architecture employs multiple pipelines that improve search throughput.

Each PE including an SRAM, FIFO queue and match logic is organized in a two dimensional circular structure that remove length limit in pipelines and provide memory balance on SRAMs. Hence the design supports any kind of prefix tree both in IPv4 and v6.



Methods and Apparatuses for the Joint Detection of the Number of Sources and Their Direction of Arrivals



A Common Method for the Sources in Different Forms

The present invention is related to the field of communications, wireless sensors and sensor arrays. One of the important application and use of the innovation is to detect the number of sources in the environment with the help of an apparatus which consists of a number of sensors.

Advantages

Error functions are found without requiring a search

High communication capacity

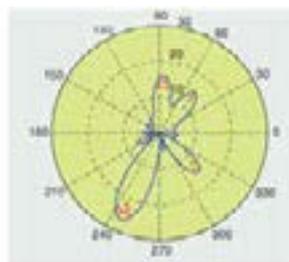
High efficiency

Acceptable performance loss

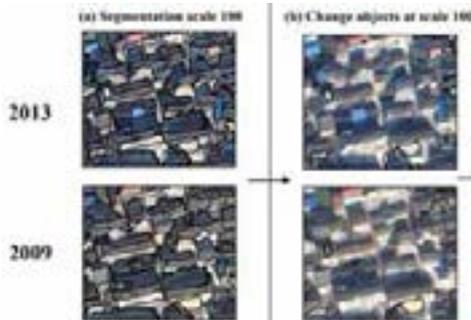
The apparatuses and method for finding the number of signals of the sources and their direction of arrivals

There are a variety of methods and algorithms for the detection of the number of sources by using a sensor array. In this invention, the presented methods perform significantly better even when the above assumptions do not hold. This innovation finds the number of sources in a simple and relatively efficient manner. Furthermore, DOA's for the corresponding sources are found at the same time. There is no search process. The accuracy of the innovation is better than the alternative techniques.

One of the most important parts of source estimation is the selection of an error criterion. In this invention, two different criteria are used namely, deterministic maximum likelihood error criterion (DTML) and stochastic maximum likelihood criterion (STML). These two criteria are used by employing root-MUSIC algorithm first. Therefore error functions are computed without a search process.



Integrating Different Profiles to Form a Process



High Efficiency for Integration and Interoperability

It is a method to integrate different profiles to form a process.

Advantages

- Automatic and fast result
- Multi-party collaboration
- High accuracy
- Graphical interface use

IHE actors are easily grouped

To develop interoperability solutions, industry uses interoperability profiles. An important initiative, Integrating Healthcare Enterprise (IHE), has adopted this profile approach to provide e-health interoperability. However, profiles are defined for specific use cases, and it is necessary to combine multiple profiles to provide the desired functionality. It is very difficult to do this manually because IHE has defined too many profiles.

With the method developed by the invention, the automatic extraction of the integrated workflow definition has been achieved when the IHE actors are grouped. For this purpose, the IHE profiles are defined by the OASIS ebXML Business Process Specification standard, a standard that can be processed by computers.

At the same time, this process was supported by a graphical interface. IHE profiles are tested by companies after they are applied for certification. The invention also allows for the automatic configuration of these tests.



An Education Method

A Language Teaching Method with a Mobile Phone

The invention is based on the idea of using multimedia messages (MMS) and short messages (SMS) over mobile phones in teaching English or another language.

Advantages

Learning with mobile phone independent location and time

On-line evaluation

A motivator from the outside for motivation to start studying

Being a multimedia based system

Internet connection is not required because it is based on MMS and SMS

An education system for language teaching via mobile

In the method developed by the invention, students are encouraged to work by sending them multimedia or short messages and exercises and application materials. This allows students to practice without opening a lecture note or book, without connecting to a website or using a teaching software. The invention combines lecturing with MMS that will be delivered via mobile phone and exams with SMS which will again be delivered via mobile phone.

The most basic innovation is that the prepared teaching materials can be composed of four separate components as video, graphics, plain text and audio and can be sent as MMS to users at the desired time of day via mobile phones. Another innovation is the interactive SMS test system.



Game Based Eye Training System for People with Low Vision

Eye Training with Games

The system is an eyesight training system based on computer technology and works with an eye tracking device.



Advantages

The training system based on computer technology for enhancing the eyesight

Objective evaluation

The tracing of the eyesight during the process

The training can be maintained at home and the enhancements can be tracked remotely

It is a game based and a motivating system

A training system for enhancing the eyesight of people with low vision

There is a need for training systems to enhance eyesight of people with low vision. It is hard to obtain objective and effective results from the systems used before our invention because they were based on instructor and classical materials. However, the invention is aimed to obtain objective and effective results because it is a game based computer technology.

The technology is basically a system which works with a computer and an eye tracking device on it. The gaze points of the users on the screen are identified by the developed system. When the user sees and focuses on the object on the screen, system moves to the next step. The training session is realized as a computer game. User does his/her eye training with a special designed computer game.



Electronic and Motorized Wheelchair System That can be Controlled with Eye Movements



Walking with eyes

It is related to a computer-based system, in which commands using only eye movements, can be sent to the electronic and motorized wheelchair.

Advantages

Moving wheelchair by eye movements

Providing movement ability for paralyzed people

Moving wheelchair forward, backward, right and left via eye movements

Giving commands to wheelchair via computer-based system

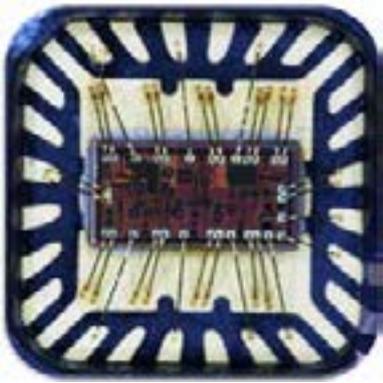
Based on eye movements

Providing eye movement based system for paralyzed people

The invention can provide movement for an electronic wheelchair that is connected to a computer based system using only eye movements without the need to use any kind of devices such as a control lever, computer with wireless connection, tablet computer, and mobile phones that are usually necessary to use the motorized wheelchair.



A Phase Coherent Digital Step Attenuator



A Digital Step Attenuator for 5G and Beyond

By reducing the unwanted phase shift, the invention makes it easier to design phased array systems for next generation communication (5G and beyond) and radar systems.

Advantages

Cheap

Solution to the phase shift problem without increasing the semi-conductor area

Reliable

Solution the phase shift problem without the need for problematic flip-chip packaging

High performance

4-folds reduction in phase shift while achieving similar accuracy and linearity specifications with the state-of-the-art

Lower system cost

With the reduction of the phase-shift, lower phase-array system cost, by decreasing the phase calibration cycles

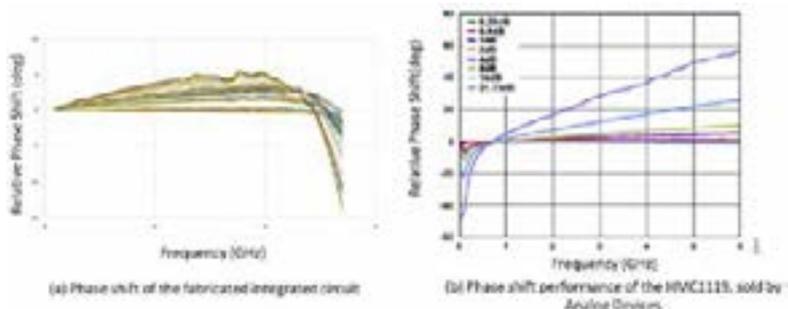
Adjustable to the specifications

Adjustable circuit topology to design digital step attenuators for different frequency and phase shift specifications

Reduces the unwanted phase shift with respect the state and frequency changes

With switchable filter elements, the unwanted phase shift inherent to the standard digital step attenuators (caused by the low-pass, high pass architecture) is reduced. While achieving low phase shift, other important systems specifications, such as accuracy and linearity, were not sacrificed.

With this invention, a 4-folds reduction of phase shift was achieved, while keeping accuracy and linearity specifications on par with the state-of-the-art digital step attenuators.



Performance comparison of the fabricated digital step attenuator with that of one of the state-of-the-art products

Remote Voting and Vote Verification System



Remote Safe Voting System

A voting system has been developed that allows individuals to vote on their own computer via Internet and later check whether this it is counted correctly or not.

Advantages

Allows individuals to vote without going to the polls

The ballot papers are digitally transmitted safely

Significantly reduces selection costs

It is a safe system since it allows verification

Since the system supports all kinds of selection system, it does not require additional cost after installation

It is possible to vote safely without going to the polls

The invention provides an improved authentication system using smart ID cards. For verification, existing symmetric and asymmetric encryption and signing algorithms are used.

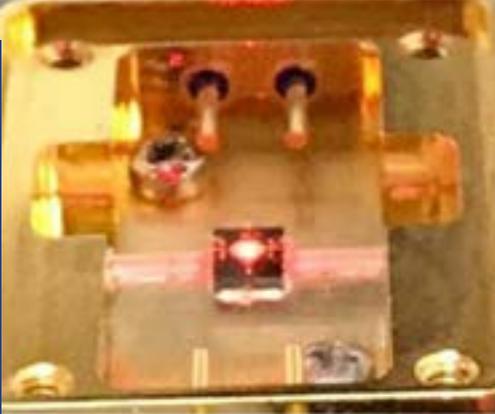
With the invention, it is possible to vote as secure as a normal election, without having to go to the polls. Particularly, it facilitates the voting of the citizens living abroad, thus contributing to the higher participation rate in the elections. It also significantly reduces the cost of the elections, as there is no need to set up and carry the poles.



Fiber Optic MEMS Microphone

Immune to Electromagnetic Interference, High Sensitivity, MEMS and Fiber Optic Based Microphone

This invention presents a superior microphone compared to other fiber optic MEMS microphone due to its optically adjustable deflectable membrane design, which is the most sensitive element of the microphone.

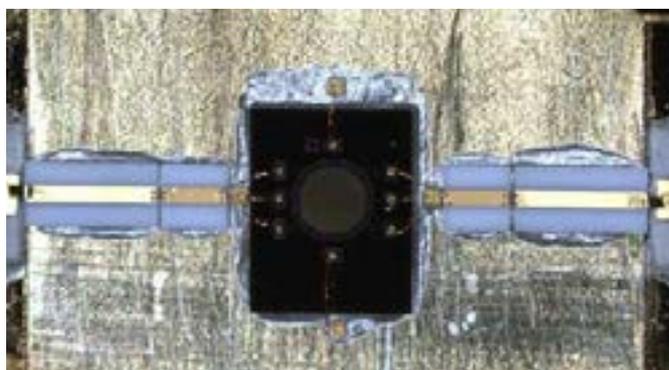


Advantages

- Reliable
- Long lifetime
- High sensitivity
- EM immunity
- Durability against harsh conditions

Reliable, high sensitivity, durability against harsh environments type microphone solution

Fiber-optic MEMS microphones are obtained by combining MEMS passive diaphragm and fiber optics. In this invention, an electrically adjustable MEMS membrane instead of a MEMS passive diaphragm is presented. Also, electrical power is generated from the incident laser light right on the spot of the MEMS membrane through a photodiode chip. In doing so, impractical electrical conduction along the fiber-optic cable is eliminated and the cost for large capacity use has been significantly reduced. At this point, the idea of transforming the energy of the light carried within the optical cable to the electrical voltage on the membrane by means of a photodetector is used.



MEMS Microphone chip view

Joint Direction-of-Arrival Estimation and Source Separation Method for Acoustic Sources

Next generation audio recording for next generation multimedia content

This invention is the first method that can jointly localise and separate sound sources from recordings of complex sound scenes with high computational efficiency and audio quality.



Advantages

High audio quality

It allows higher sound quality than other methods that rely on beamforming

Accuracy

It allows estimating the directions of sound sources with very high accuracy

Low computational cost

It has a computational cost that would allow operation in real-time

Compatibility with next-generation audio (NGA) systems

It can be used to extract audio objects and the features of the sound scene

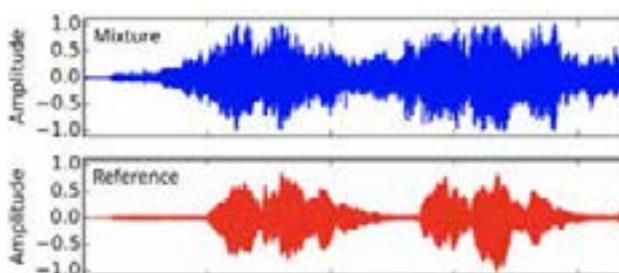
Backwards compatibility

It can be used both with real recordings made with spherical microphone arrays and with synthetically generated higher-order Ambisonics (HOA) signals

It allows estimating the directions of sound sources with very high accuracy

Next generation broadcast systems rely on object-based audio which has recently been standardised by ISO/IEC as the MPEG-H 3D Audio standard. One of the most critical problems of object-based audio (OBA) workflow is the extraction of audio objects from real recordings of sound scenes. The invention provides an efficient solution to this problem

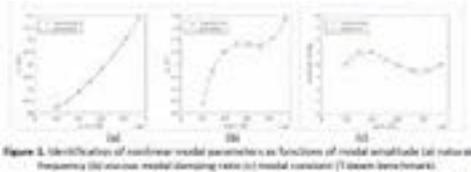
This technology is an innovative signal processing method that allows jointly estimating the directions of sound sources and separating them from recordings made using rigid spherical microphone arrays. After applying a windowed Fourier transform and the spherical harmonic decomposition, a sparse, dictionary-based representation of the sound field is used to obtain a time-frequency-direction-amplitude parameterisation which is followed by virtual beamforming to achieve high performance in jointly estimating the directions of sound sources and separating them even under high levels of reverberation.



A Novel Experimental Modal Analysis Method for Nonlinear Engineering Structures Based on Response Control Approach

Response Controlled-Stepped-Sine Testing (RCT)

The invention provides experimental modal analysis of nonlinear systems, which yields modal models for nonlinear systems. It also provides direct experimental extraction of frequency response curves, including any unstable branch by using standard/commercial modal testing equipment innovatively.



Advantages

Pioneering

Identification of nonlinear modal parameters and direct experimental extraction of unstable frequency responses, which is not an available option in standard/commercial modal testing hardware/software

Simple and Innovative

No need for sophisticated control architecture: Standard/commercial modal testing hardware is used innovatively

Low Investment Cost

The invention can be implemented as a simple “software patch” which can be integrated to commercial modal analysis software

User friendly

Innovative use of linear modal analysis tools to identify (strongly) nonlinear systems. The method can be easily adopted by practicing engineers, which makes it very attractive for industrial applications

High Technology Readiness

Fully integrated with standard/commercial modal testing equipment. Actual methodology has been thoroughly demonstrated and tested on a benchmark test setup and real engineering structures: T-beam benchmark with strong stiffness nonlinearity, real missile structure with bolted-joint nonlinearity and control fin actuation mechanism of a real missile which exhibits strong nonlinearity due to backlash and friction

Experimental Modal Analysis of Nonlinear Systems

- Closed-loop control of the response amplitude during stepped-sine testing (RCT strategy) with standard commercial modal testing equipment.
- Quasi-linearization of frequency response curves by keeping the response (displacement) amplitude of the driving point constant during stepped-sine testing.
- Experimental extraction of nonlinear modal parameters by applying standard linear modal analysis tools to quasi-linear frequency response curves.
- Synthesis of frequency response curves for untested harmonic forcing scenarios by using identified nonlinear modal parameters, and by employing Newton's Method with arc-length continuation algorithm.
- Construction of the so-called Harmonic Force Surface (HFS) from harmonic force spectra measured (at constant displacement amplitude levels) with standard commercial modal testing equipment.
- Extraction of unstable frequency responses of nonlinear systems from HFS.

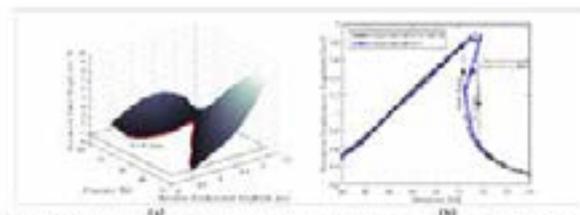


Figure 2. (a) Determination of the harmonic response spectrum with any existing unstable branch by cutting HFS with a constant force plane (b) Comparison of the response spectrum obtained by HFS with the one obtained by force controlled testing (T-beam benchmark)

