

## **Özyegin University Technology Transfer Office ,Turkey**

Özyegin University (ÖzÜ) ranks among the nation's leading research universities, a place where outstanding faculty, staff, and students come together to further the pursuit of scientific understanding and innovation. In 2012 and 2013, ÖzÜ ranked in the top 10 universities based on the "Entrepreneurship and Innovation Index" published by Ministry of Science, Industry and Technology. This success led us to get the Technology Transfer Office (TTO) support of 10 million for 10 years from TÜBİTAK and is a tremendous affirmation that our efforts to build an "entrepreneurial research university" are succeeding.

### **Services**

ÖzÜ Technology Transfer Office's mission is to encourage that innovation, enhance sponsored research and facilitate economic development through the effective management and transfer of ÖzÜ technologies and intellectual property. Our focus is to ensure the results of the outstanding research at ÖzÜ are successfully transferred outside the University to drive national economic growth and benefit the general public.

ÖzÜ TTO is responsible for all pre- and post- award operations pertaining to all sponsored research activities, i.e., grants and contracts. TTO is also responsible for managing the intellectual property (IP) assets of ÖzÜ. TTO receives invention disclosures from faculty and evaluates these disclosures for their commercial possibilities, and license them to industry. As a result of these activities, TTO helps to transfer research outputs to the benefits of the society and therefore, it manages the "innovation process" of the University.

- **Sector** :Technology Transfer

### **Team**

- IREM ÜNAL NIZAMOGLU, Intellectual Property Attorney
- GIZEM ASKER, Project Development Specialist
- NORA KAYAER, Grant Project Development Specialist
- SELIN UYSAL, Intellectual Property Specialist

## **Radial Flux Motor With A Conical Stator And Rotor Assembly**

**Sector** :Automotive

**Problem:**

Prior motors, in particular induction motors, have had several disadvantages. Prior motors use a significant amount of air space and can be large and heavy when assembled, making shipping of an electric motor costly. In order to get enough shaft torque, motor length should be increased mostly

**Technology:**

The present invention provides for advantageous conical geometry of a stator and a rotor, thereby providing both radial flux and axial flux ("radial" flux) simultaneously. In order to get enough shaft torque, the purpose of invention is regarding to reduce increasing motor length by design of conic geometry. In this way, conic geometry provides both decreasing motor length and getting high shaft torque because using radial and axial flux simultaneously.

### **Description**

The present invention addresses prior disadvantages and problems by providing for advantageous conical geometry of a stator and a rotor, thereby providing both radial flux and axial flux ("radial" flux) simultaneously. Advantageously, the present invention maximizes and/or optimizes the radial space available in order to advantageously use the increased radial dimension of a conical design to increase the moment arm to increase available torque at the drive shaft of the motor. Furthermore, the present invention provides for increased efficiency, torque-speed, and improved space utilization for a motor.

In accordance with an embodiment of the present invention, a radial flux electric motor is provided. The electric motor includes a shaft having a rotor end and a fixed end, and a conical rotor rotatably coupled to the shaft adjacent the rotor end, the conical rotor including one of a squirrel cage or a plurality of magnets. The motor further includes a conical stator coupled to the shaft between the conical rotor and the fixed end and coupled to the conical rotor by a roller bearing, the conical stator including metal windings for flow of an electric current, wherein the conical rotor is configured for rotational movement about a lengthwise axis of the shaft while the conical stator and the shaft are stationary. A conical air gap is defined between the conical rotor and the conical stator.

### **Primary Benefits**

- Invention maximizes and/or optimizes the radial space available in order to advantageously use the increased radial dimension of a conical design to increase the moment arm to increase available torque at the drive shaft of the motor.
- The present invention provides for increased efficiency, torque-speed, and improved space utilization for a motor.

### **Development Status**

- **Stage of Development** : Prototype
- **Time to Market** : 1-3 year

### **Market & Competition**

The Product is designed for Automotive Market (Electric Vehicle, E-Bike, All Terrain Vehicle (Electric Version), Tractor, etc). Currently, the product has been manufactured by our competitors for many applications. But these restriction is very expensive solution. Also many products in the market are imported by EU and US. Therefore, We try to develop cheap and utility solution for the market.

#### **Potential Sectors**

Automotive

#### **Potential Regions**

Turkey  
EU

### **Interest In**

Actually, the point is that prototyping and testing processes are very important to verify and to validate the our technology Therefore we need to get immediately funding for test bench and optimized prototypes. In this way, we will validate and be ready to commercialize our technology.

## Fluorescent Protein Integrated Light Emitting Diodes

**Sector** :Biotechnology

Bio-friendly, energy efficient and high-color quality solid-state lighting is required due to the current limitations of phosphor-based LED technology and the currently investigated nanocrystal-integrated LED technology.

### Description

We propose a new class of color-conversion LEDs integrated with fluorescent proteins to overcome the disadvantages of currently used and investigated color conversion materials.

### Primary Benefits

- efficient and stable white light generation by strong absorption, high fluorescence quantum yields and high photostability,
- the custom-designed emission spectrum by the narrow-emission linewidth of fluorescent proteins,
- biocompatible characteristics (green lighting).

### Development Status

- **Stage of Development** : Concept
- **Time to Market** : 1-3 year

### Market & Competition

This new invention could be used in lighting field for a bio-compatible technologies. The key words for this invention are fluorescent proteins, proteins, light-emitting diodes, color-conversion, color, color-converter, green lighting, white light-emitting diodes, biocompatible lighting.

### Potential Sectors

Biotechnology  
Energy

### Potential Regions

Turkey

### Interest In

We interest in meeting with entrepreneurs and business partners to commercialise our inventions, which are the final products of researches of our exceptional academicians, and make them useful for the relevant industries.

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## **Adaptive Multiple Input Multiple Output Optical Ofdm Based Visible Light Communication**

**Sector** :Communications

Technology:

This invention presents a new method and system for adaptive where several transmission parameters such as modulation size/order, type and configuration of multi-input multi-output (MIMO) communication techniques are optimally adjusted according to channel conditions. This invention will significantly enhance VLC system performance in terms of link reliability and data rate.

### **Description**

The present invention proposes a system composed of several source and destination nodes that can communicate at a high performance without compromising the spectral efficiency. The system applies random network coding, cooperative communication and orthogonal frequency division multiple access (OFDMA) techniques for high performance. Network coding is combining packets at the relay nodes. The main idea behind network coding is contradictory to the independent processing of data, where relay nodes (routers) mainly process the packets and then forward them, instead of the simple store and forward architecture. The network coding has the potential to address the ever increasing number of users and devices in cellular networks.

Furthermore, the proposed system can also function in a two-way communication set-up (node A can transmit data to node B whereas the node B also simultaneously transmits data to node A). The arrangement can also be reduced to a single transmitter and a single receiver scenario.

### **Primary Benefits**

- Adaptively choosing transmission parameters according to channel conditions
- Improved link reliability
- Increased data rate

### **Development Status**

- **Stage of Development** : Proof of Concept
- **Time to Market** : 1-3 year

### **Market & Competition**

According to a recent market analysis, the global VLC market is expected to reach approximately USD 15 billion by the end of 2023. While there are some start-up companies in VLC area, their product offerings do not have required specifications to satisfy the demanding user needs. A new start-up company with a high-performance

VLC modem product has the potential to grow quickly and get a significant share of this emerging market.

**Potential Sectors**

Communications  
Information Systems

**Potential Regions**

United States  
EU

**Interest In**

OKATEM at Ozyegin University is the first R&D center of Turkey specialized in optical wireless technologies. OKATEM is interested in the development of collaborative projects with industrial partners to commercialize this promising technology.

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## Light Engine System Preferred In Led-Based Lighting Systems

**Sector** :Electronics

**Technology:**The technology is related to an innovative cooling technology developed for LED applications in automotive and general lighting industries, and it uses advanced micro-fluidic printed circuit board technology approach that minimizes the heat resistance rendering heat conductivity for more efficient light extraction and longer lifetime compared to standard printed circuit boards.

### Description

Departing from the state of the art, this invention aims to eliminate the existing disadvantages through improvements made in PCBs in LED lighting apparatuses used especially in automotive industry.

Another purpose of the invention is to enable dissipation of heat generated in PCBs over the board. Thus, probable negative effects of high temperatures on LED lighting components are avoided, thereby extending their useful operating life. Another purpose of the invention is to create a structure preventing the heating of PCB boards.

Another purpose of the invention is to eliminate local hotspots on the PCB. Yet another purpose of the invention is to assure more lumen extraction and a lower cost. Thus, a longer useful operating life is provided for PCB and LED. Yet another purpose of the invention is to generate a compact unit structure for LED and PCB units.

For achievement of the purposes mentioned in the preceding paragraphs, some innovations have been made in PCBs used in multifunctional LED applications, and having an electronic side with circuit components and a LED side with lighting components.

### Primary Benefits

- Eliminating local hotspots on the PCB
- Enabling dissipation of heat generated in PCBs over the board
- Enabling an effective dissipation scheme over PCBs
- Extending useful operating life.

### Development Status

- **Stage of Development** : Proof of Concept
- **Time to Market** : 1-3 year

### Market & Competition

This patent enables compact, high density packaging for current LED lighting systems. In addition, it also enables IoT features with higher heat generation rates. This

technology's market areas are Turkey, USA, Europe and Asia.

**Potential Sectors**

Electronics  
Energy

**Potential Regions**

Turkey  
United States

**Interest In**

We are interested in investment as well as licensing of our patents.

## **Preferred Optothermal Led Lighting Embodiment For High Lumen Extraction And Extended Lifetime**

**Sector** :Energy

The cooling technique disclosed in this patent is the only and most efficient solution for solving the problem of hot spots formed both in the chips of LED systems where a plurality of LED chips are used, and in the phosphor used for changing color in LEDs.

### **Description**

The general aim of all of LED light cooling methods is to prevent the problems that are likely to occur due to the high heat formed during operation. However, such cooling methods are not sufficient in case of using lamps with high power and light intensity; therefore, more efficient methods are needed.

With this technique, ideas on heat rejection have been developed. Thanks to the cooling system according to the invention, the heat will be taken from the chip and phosphor, and will be made to reach to the heatsink (i.e. heat rejecting block), with the effect of naturally formed termosyphone or forced convection (by means of a pump). Moreover, other electronic and control sensors provided on the system called light engine will thus be cooled down, as well. More light extraction and extending lifetime of the light source are anticipated as double-effect output.

### **Primary Benefits**

- To cool down LED lamps in an efficient manner
- To increase the durability and the amount of light to be obtained from LED lamps
- To reduce the weight of lamp
- To reduce quantum efficiency (light intensity)
- To reduce the thermal resistance between the chip and heatsink to a great extent
- Low in cost when compared to the active cooling methods

### **Development Status**

- **Stage of Development** : Prototype
- **Time to Market** : 1-3 year

### **Market & Competition**

There are at least two thousands applications per year regarding LED light cooling method technologies (PatBase reference). The primary markets are US and China according to the number of applications. Thus, our application is filed in USPTO, and we would like to enter into this market with our novel and needed technology.

#### **Potential Sectors**

Energy  
Mechanical

#### **Potential Regions**

United States

## **Interest In**

We interest in meeting with entrepreneurs and business partners to commercialise our inventions, which are the final products of researches of our exceptional academicians, and make them useful for the relevant industries.

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## **A Flow Controlled Effective Led Based Lighting System**

**Sector** :Energy

The lighting system of the present invention, heat sink, optic structure (LED chip and phosphor -like materials, and diffuser) and electronic circuit members are configured in an integrated manner to enable to cool down the LED chips and other electronic circuit members.

### **Description**

Heat sinks are the passive cooling components used for removing the heat released by the electronic devices. In the systems where active cooling is used, the actively cooled heat sink with fans decreases the reliability of the system and causes extra energy loss. Additionally, the temperature of chip, which increases together with the heat that cannot be removed decreases the amount and quality of the generated light, shortens the lives of chips and may cause failure of LED.

The lighting system of the present invention, heat sink, optic structure (LED chip and phosphor -like materials, and diffuser) and electronic circuit members are configured in an integrated manner to . Therefore, the cooling fluid washes the surfaces effectively and receives the heat. Therefore, both the weight and size of the heat sink are decreased and it is enabled to cool down the LED chips and other electronic circuit members as the driver in a multi-purpose manner.

### **Primary Benefits**

- To cool down the LED chips and other electronic circuit members as the driver in a multi-purpose manner
- Achievement of aesthetic appearance, and wide-angle light diffusion
- To maximize the heat removal by natural convection and thermal radiation
- Provide a favorable light distribution

### **Development Status**

- **Stage of Development** : Prototype
- **Time to Market** : 1-3 year

### **Market & Competition**

LED lighting technology has rapidly growing market around the world. Thus, LED cooling technology is becoming more important. In the last five years, there more than 8.000 patent applications on the LED cooling technology, most of them are from China, and United States. Owner companies are mostly American origin companies. We have applied for this patent in the US since we believe that the market share is large according to the analytics.

**Potential Sectors**  
Energy

**Potential Regions**  
United States

Electronics

Turkey

**Interest In**

We are looking for licensee candidates who are/wants to be in the LED sector.

## **A Lightening System That Adjusts Lighting Duration And Density**

**Sector :**Energy

The invention is comprised of Passive Infra-Red (PIR) sensor, which is the most suitable system for automatic lighting. The PIR sensor array not only detects the movements, but also perceives the presence of a person.

### **Description**

Current technology provides automatic lighting systems that recognize one's movement. However, in these systems lighting sensors are programmed to remain open for a determined period of time, and it switches off itself even if the person is still present and needs light. Sometimes, sensors are programmed to remain for a long time to prevent this problem; however it causes decrease in energy efficiency. There are different types of sensitive sensors such as single or multi color infrared camera systems, laser scanning systems, or ultrasonic systems. Nevertheless, all of these systems have drawbacks as high costs, technical difficulties or sizeableness.

The invention is comprised of Passive Infra-Red (PIR) sensor, which is the most suitable system for automatic lighting. The PIR sensor array not only detects the movements, but also perceives the presence of a person.

### **Primary Benefits**

- To provide energy efficiency
- Easy integration to the LED light bulbs due to the small size of the sensor
- Low-cost
- Detection of the presence of a person

### **Development Status**

- **Stage of Development :** Prototype
- **Time to Market :** 1-3 year

### **Market & Competition**

The key words for this invention are infrared sensors, light sensors, automatic lighting.

#### **Potential Sectors**

Energy  
Electronics

#### **Potential Regions**

Turkey

### **Interest In**

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academicians, and make them useful for the relevant industries.

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## **Acousto- Optic Transducer, Array And Method**

**Sector** :Energy

A nanoscale acousto-optic wireless communication modulator and transducer converting the vibrations of multi-layer graphene resonator to multi-color photon emission is designed by utilizing VFRET mechanism introduced in this patent that can be used for energy harvesting in certain applications, as well as in nano technological and biomedical applications, in a way not previously possible with prior art photophones.

### **Description**

This invention relates to a method of converting sound into light. The graphene resonator is responsive to sound to bring the donor molecules within range of acceptor molecules for Förster resonance energy transfer (FRET) between the donor molecules and the acceptor molecules.

A single unit nanoscale transducer is shown in the picture illustrates the donor molecule is continuously excited by the ambient or external visible light sources. Therefore, the donor molecule is chosen as a specific chemical substance satisfying this property. The source of the energy where the acceptor molecule converts to photon emission is obtained from the donor molecule. The entry window is arranged to permit incoming light to fall on the donor molecules, and the exit window is arranged to allow light emitted by the acceptor molecules to leave the acousto-optic transducer. This solution is beneficial because it allows the acousto-optic transducer to be manufactured at a nanoscale, to be adjusted in sensitivity to different volumes or amplitudes of sound, for example by varying the separation between the donor molecule and the acceptor molecule, and to be tuned to emit different wavelengths of light by adjusting the constitution of the donor molecule and/or the acceptor molecule in one of several different ways. Moreover, the donor molecules are illuminated with ambient light, thereby allowing the acousto-optic transducer to be operated as a passive device, which does not require any electrical power to operate.

### **Primary Benefits**

Advantageous embodiments of the invention may be configured according to any claim and/or part of the following description.

Preferably, at least one of the at least one donor molecule and the at least one acceptor molecule comprises a quantum dot. A quantum dot is a nanoscale particle having quantum properties, which may include their optical and/or electronic properties, which differ from the properties of particles made of similar materials, but at larger scales, as a result of quantum effects. Thus, for example, at least one of the at least one donor molecule and the at least one acceptor molecule may be coated onto a nanoscale particle or otherwise embodied as a quantum dot, and the optical properties of the donor molecule and/or of the acceptor molecule may be varied according to choice, by adjusting one or more properties of the nanoscale particles, such as their size and/or shape.

Preferably, at least one of the at least one donor molecule and the at least one acceptor molecule comprises an inorganic compound of a group 12 element with a group 16 element (in other words, a compound of a group 11B element with a group VIB element under the former IUPAC group nomenclature). Such II-VI compounds have desirable optical properties, which can be engineered to suit different applications.

If so, the inorganic compound is preferably selected from a group consisting of cadmium sulphide, cadmium selenide, zinc sulphide and zinc selenide.

### **Development Status**

- **Stage of Development** : Proof of Concept
- **Time to Market** : 1-3 year

### **Market & Competition**

Detailed information will be given during the interview.

#### **Potential Sectors**

Energy  
Electronics

#### **Potential Regions**

EU

### **Interest In**

Detailed information will be given during the interview.

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## **Cement-Based Compositions With Improved Rheological Properties And Methods For Production Thereof**

**Sector :**Materials

**Problem:** Cement-based materials tend to segregates due to variation in material characteristics, thus require use of viscosity modifying agents (VMAs). Existing VMAs in the field of construction are achieved through laborious and costly production processes.

**Technology:** A new kind of bio-based VMS is developed through use of micro-swimmer microorganisms, which can both improve viscosity without sacrificing yield strength of the material.

### **Description**

The present invention provides rheologically improved cement-based compositions which are obtained through the use of non-pathogenic bacteria that are readily available from nature.

Cement-based compositions according to the present invention contains *Sporosarcina pasteurii*, *Bacillus magetrium*, *Bacillus subtilis* and *Paenibacillus polymyxa* strains which are known to be actively buoyant in solutions. The present invention is based on the use of polysaccharides inherently present in bacteria cells and the motility characteristic of said bacteria in cement-based compositions. It has been found that, through addition of such cells to the system, cement-based compositions could synergistically modify their rheological properties including e.g. bleeding, flowability and water loss control (i.e. water retention) and other properties.

Possible uses for the invention are that the crack injection grouts for reinforced concrete structures, cement based binders for tiles, **structural rehabilitation**, S3-S4 consistency concrete mixes for non-structural applications.

### **Primary Benefits**

- Sustainable and cost efficient
- Increased bleeding and segregation resistance
- Increased viscosity without sacrificing yield strength
- Improved performance
- Self-healing ability at both fresh and hardened state

### **Development Status**

- **Stage of Development :** Concept
- **Time to Market :** 1-3 year

### **Market & Competition**

- As of 2013, concrete production is recorded as 115 million m<sup>3</sup> ~7% CAGR
- Concrete mixes (S3, S4,S5, SCC) require superplasticizers and VMAs takes almost 60% of the production every year.

Potential uses in the industry:

- Ex. 1: Crack injection grouts for reinforced concrete structures
- Ex. 2: Cement based binders for tiles
- Ex. 3: Rehabilitation of historical structures and buildings
- Ex. 4: S3-S4 consistency concrete mixes for non-structural applications

**Potential Sectors**

Materials

**Potential Regions**

Turkey

EU

**Interest In**

- Meeting with possible potential users of the invention
- Meeting with SMAs/other possible producers to extend the massive production of the admixture.

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## **Vertical Gap Actuator For Ultrasonic Transducers And Fabrication Of The Same**

**Sector :**Medical

In order to address the limitations of piezoelectric transducers, capacitive micromachined ultrasonic transducers (CMUTs) have been introduced. Since the first introduction of CMUTs, extensive research has been performed on fabrication, modeling and applications. Main challenges of CMUTs can be traced to lack of high sound pressure generation, low receive sensitivity and highly nonlinear behavior of the parallel plate actuation. There was a need for a new actuation method for the CMUT transducers that will separate the dependence of the output pressure and receive sensitivity on the gap.

### **Description**

The main objective of this invention is to develop novel cell geometry for CMUT transducers where the sensitivity and the maximum output pressure do not have conflicting requirements over the gap. This is achieved by defining the gap between a piston type section of the membrane and the sidewalls. In this geometry, the motion of the membrane does not affect the height of the gap where the actuation forces is built. Also there are large cavities under the membrane in the horizontal direction such that these cavities do not interfere with the membrane motion even for large membrane displacement amplitudes. This enables membrane to move without any hard limits.

### **Primary Benefits**

It solves the low output pressure problem of CMUTs  
Increase in the receive sensitivity  
Cost reduction

### **Development Status**

- **Stage of Development :** Proof of Concept
- **Time to Market :** 1-3 year

### **Market & Competition**

This new invention could be used in medical field for ultrasound imaging, medical imaging. The key words for this invention are transducers, CMUT technology.

### **Potential Sectors**

Medical  
Healthcare

### **Potential Regions**

Turkey  
EU

### **Interest In**

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## **Bionic And Hybrid Prosthetic Hand Embodiment**

**Sector :**Medical

Currently, as a result of the researches conducted on the prosthesis users, it is found out that the factors relating to the performance of a prosthetic hand are the functionality, interaction with the surrounding, low weight, high speed of grabbing and power, being noise-free or minimum level of noise and visibility. The ideal prosthetic hands need to meet these criteria. In order to provide the “grabbing” function in the active prosthetic hand embodiments available in the state of the art, various kinds of direct current motor are used on the part which moves the fingers. The functionality and the grabbing power in the systems that are moved by means of direct current motor are high. However, the system works in a noisy way, and it poses a disadvantage compared to a normal human being hand in terms of natural view of a hand and its weight.

### **Description**

The object of the present invention is to provide a high grabbing speed and power by using DC motor in the first three fingers as they are more actively used than the other two fingers (ring and little fingers). A further object of the present invention is to provide light and noise-free working by using Shape Memory Alloys(SMA) actuator in the ring and little fingers which move less compared to the first three fingers. The present invention relates to a bionic hybrid prosthetic hand embodiment comprising phalanges springs providing the fingers to return back following the grabbing; so as to provide a hybrid embodiment by using the shape memory alloy (SMA) and DC motors at the same time.

### **Primary Benefits**

The hybrid hand according to the present invention has been developed so that it can fulfill the daily-life activities and be used in a lighter and more effective manner. the present invention is to provide low weight, natural view, noise-free working and low energy-consumption which are necessary for a prosthetic hand performance by making use of SMA.

### **Development Status**

- **Stage of Development :** Proof of Concept
- **Time to Market :** 1-3 year

### **Market & Competition**

This new invention could be used in medical field for hybrid artificial organ. The key words for this invention are prosthetic hand, hybrid hand, shape memory alloys (SMA).

**Potential Sectors**  
Medical

**Potential Regions**  
EU

Biotechnology

Turkey

### **Interest In**

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## **Method And System For A Portable Ultrasonic Imaging System**

**Sector :**Medical

Ultrasonography is an ultrasound based medical imaging technique widely used in medicine. However, those are sizable and therefore disable to be carried easily by medical practitioners. There is an absolute need for low cost and portable ultrasound imaging systems.

### **Description**

Ultrasonography is an ultrasound based medical imaging technique widely used in medicine. Ultrasound machines cost \$100K-\$250K because of sophisticated multichannel electronics. Additionally, those are sizable and therefore disable to be carried easily by medical practitioners. There is an absolute need for low cost and portable ultrasound imaging systems.

The proposed technique uses motion sensors that are embedded with the probe to track the position of the ultrasound signals. This eliminates the use of a transducer array and beam forming electronics and enables very low cost imaging systems. Potentially, this device can make ultrasound imaging routine part of the clinical exam. It could also be used in emergency rooms and ambulances due to its small feature especially to detect internal bleeding.

### **Primary Benefits**

- low cost,
- small form factor (handy use),
- wireless interface.

### **Development Status**

- **Stage of Development :** Prototype
- **Time to Market :** 1-3 year

### **Market & Competition**

This new invention could be used in medical field for ultrasound imaging, medical imaging. The key words for this invention are portable ultrasound, ultrasound imaging, and medical imaging.

#### **Potential Sectors**

Medical  
Electronics

#### **Potential Regions**

EU  
United States

### **Interest In**

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inventions, which are the final products of researches of our exceptional academicians, and make them useful for the relevant industries.

## **Nanoplasmonic Device With Nanoscale Cooling**

**Sector :** Nanotech

This specific technology offers a novel nanoplasmonic device with nanoscale cooling affect providing satisfactory cooling in an efficient and compact manner for various products such as in hard disk drives in computing and sensor systems. The device comprises a unique “nanoplasmonic layer” having a heating side and a cooling side and also includes a cooling structure adjacent to the cooling side of the “layer”. The localization of these cooling structures is engineered for rapid cooling and focused cooling effects- minimizing any heating related performance loss in real life applications.

### **Description**

The overall design of this novel device enables to remove heat from the layer effectively in a compact manner. This technology will play a crucial role in breaking the technical limits that are encountered in various products. For example, a successful integration of this technology with hard disc drives will extend the annual increase of data storage capacity at or above 40%, which has been slowing due to the superparamagnetic limit.

### **Primary Benefits**

- To increase the data storage capacity at or above 40 %, annually
- High performance
- Rapid cooling
- Compact manner

### **Development Status**

- **Stage of Development :** Prototype
- **Time to Market :** 1-3 year

### **Market & Competition**

Nanoplasmonic applications including magnetic memory, and photovoltaic cells make use of an optical spot smaller than the diffraction limit. This can result in substantial localized heating. Heat can be removed with a bulk metallic layer, but this can result in general heating by spreading the heat and may as well change the near- field characteristics of the device. In general, it may be difficult to obtain satisfactory cooling in an efficient and compact manner.

### **Potential Sectors**

Electronics  
Medical

### **Potential Regions**

United States  
EU

### **Interest In**

Licensing opportunities.

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## **A Heating Element Comprising Of Nanostructures For Lime-Scale Prevention**

**Sector :**Nanotech

The present invention comprising of Chemical Mechanical Polishing induced nanostructures, which are capable of constantly preventing lime-scale build-up at the liquid/heating element interface.

### **Description**

The heating elements used to heat liquids generally operate in direct contact with the liquid environment, which is typically water with ionic contents such as calcium and magnesium. The resulting lime-scale prevents the heat exchange from the heating element through the liquid by significantly thickening over the time (reaching to millimeter to centimeters) and significantly reduces the operating efficiency. In the current state of the art, heating elements are coated using coating materials building up less lime-scale in order to reduce lime-scale formation. However, these coatings also cause the heating element to transmit less heat. Over time, an unavoidable lime-scale formation on the applied coating layer is still observed.

The present invention comprises of a heating element with surface nanostructure induced by CMP to primarily increase lime-scale build up on the heating zone with regularly induced nucleation points and then actively cleaning the formed lime-scale by creating a stress at the interface during the operation of the heating element.

### **Primary Benefits**

- A heating element capable of continuously and actively preventing lime-scale build up
- Reduction of lime-scale formation without the need of an additional coating material
- Affordable process with corrosion prevention ability

### **Development Status**

- **Stage of Development :** Proof of Concept
- **Time to Market :** 1-3 year

### **Market & Competition**

Lime-scale prevention is concerns many industrial applications from house appliances such as washing machines, dishwashers, kettles to heavy industries such as petroleum pipe-line industry, paint industry and so on. Preventing lime-scale build up with this technology will prolong the lifetime of goods, and increase the efficiency.

#### **Potential Sectors**

Nanotech  
Materials

#### **Potential Regions**

EU  
Turkey

## **Interest In**

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## **The Method Of Processing Dental Implants Using Cmp Method And Configuration Of Robotic Arm**

**Sector** :Nanotech

The present invention comprises of Chemical Mechanical Polishing processed dental implants with enhanced bio-functionality and their processing through robotics controlled system.

### **Description**

Although titanium implants are applied with a high success today, bone-to-implant connection problems occurring in some patients in the early period (fibrous non-union and infection) may lead to loss of the implant. Another important issue of implantology is the long waiting period for the bone-implant connection after the surgery. In addition, titanium implants do not have periodontal tissues like teeth, so they have low resistance against external influences in the mouth. Eliminating these inefficiencies is the basis of research for titanium-based implants in recent years. In order to provide optimum and long-term resistant bone-implant connection, the main goal is to create the appropriate surface. While provoking the rapid migration of bone cells and production of extracellular matrix, the production of bio-surface that performs pathogen leak-proof interconnection with bone and soft tissue is required in long-term.

The present invention comprises of development of a new generation dental bio-implant via CMP process, which helps surface modification through formation of protective oxide layers while spontaneously inducing surface nano-structuring. In addition the process is brought up to a 3-D polishing ability by means of robotic aided control system.

### **Primary Benefits**

- Ability of engineered bio-implant surface generation through spontaneous nano-structuring and self-protective surface layer ability
- High potential of controlled bio-activity tunable for promoted/demoted cell attachment
- High Volume manufacturability with low price through advanced robotics controlled 3-D CMP process development

### **Development Status**

- **Stage of Development** : Proof of Concept
- **Time to Market** : 1-3 year

### **Market & Competition**

CMP technology is widely used for surfaces for almost fifteen years. However, using CMP to dental applications makes our patented technology novel, and smart.

**Potential Sectors**

Nanotech  
Medical

**Potential Regions**

Turkey  
EU

**Interest In**

We interest in meeting with entrepreneurs and business partners to commercialise our inventions, which are the final products of researches of our exceptional academicians, and make them useful for the relevant industries.

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## **The Method Of Processing Multidimensional Objects Using Cmp Method And Configuration Of Robotic Arm**

**Sector :**Nanotech

The present invention provides a process that develops nanostructures by using CMP technique on the multidimensional and formless objects such as resistances.

### **Description**

In the machines, which are sub served for heating liquids, resistances are used as a heating element. Those resistances operate in direct contact with the liquids. In general, the roughness of resistances' surfaces is formless. As a result, lime-scale is built up over time in an uncontrolled manner. Additionally, current technology could be applied to only 2-dimensional plates.

The present invention provides a process that develops nanostructures by using CMP technique on the multidimensional and formless objects such as resistances. With the aid of CMP, roughness of the metal material will be adjusted by processing its surface chemically and mechanically. Moreover, in the robotic arm configuration, which is the subject of the invention, has industrial serial kinematics configuration with 6 degrees of freedom. This industrial robot arm ensures access to any point from any angle in 3 dimensional spaces.

### **Primary Benefits**

- To prevent lime-scale buildup of metal surfaces,
- To eliminate using additional material (generally chemical) to prevent lime-scale buildup,
- To ensure to access any point of a multidimensional object due to the robotic arm.

### **Development Status**

- **Stage of Development :** Proof of Concept
- **Time to Market :** 1-3 year

### **Market & Competition**

Lime-scale prevention is concerns many industrial applications from house appliances such as washing machines, dishwashers, kettles to heavy industries such as petroleum pipe-line industry, paint industry and so on. Currently, the technology allows only 2-dimensional plate applications. Thanks to our new technology, now it could be applied on to the multidimensional and formless objects.

#### **Potential Sectors**

Nanotech  
Mechanical

#### **Potential Regions**

EU  
Turkey

## **Interest In**

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## **The Method Of Processing Wide And Curved Surfaces Using Cmp Method And Configuration Of Robotic Arm**

**Sector :**Nanotech

This technology, by using CMP process, offers to minimize deterioration of the surface due to the environmental factors and improve paint adhesion capacity by forming self-protective nano films and nano texturing on the aluminum surface, simultaneously prior to painting or paint renewal.

### **Description**

During the paint renewal process, plastic, glass, fiberglass materials are covered to protect from the paint remover chemicals and then the surface is sandpapered to remove the paint. In current technology, this process is being handled manually and therefore it necessitates time and manpower.

This technology, by using CMP process, offers to minimize deterioration of the surface due to the environmental factors and improve paint adhesion capacity by forming self-protective nano films and nano texturing on the aluminum surface, simultaneously prior to painting or paint renewal. Robotic arm configuration, which is the subject of the invention, is used for processing surfaces, which are large and curved by processing chemical and mechanical polishing method.

### **Primary Benefits**

- To minimize deterioration of the surface due to environmental factors,
- To improve paint adhesion capacity,
- To extend the paint lifespan of the material by using a similar approach during repair of painted surfaces,
- To develop robotic systems for ensuring fast and effective application of the suggested process.

### **Development Status**

- **Stage of Development :** Proof of Concept
- **Time to Market :** 1-3 year

### **Market & Competition**

Lime-scale prevention is concerns many industrial applications from house appliances such as washing machines, dishwashers, kettles to heavy industries such as petroleum pipe-line industry, paint industry and so on. With this novel technology, the CMP method will be applied to large surfaces such as painting of airplanes.

#### **Potential Sectors**

Nanotech  
Mechanical

#### **Potential Regions**

EU  
Turkey

## **Interest In**

We interest in meeting with entrepreneurs and business partners to commercialise our inventions, which are the final products of researches of our exceptional academicians, and make them useful for the relevant industries.