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SCOPE OF THE CONFERENCE

"The conference will provide a platform for discussing current advancements and future trends in biomaterials for medical and pharmaceutical applications. Through the synergistic approach of applied chemistry and physics, material science, electronics, mechanical engineering, biochemistry and medicine, this Conference on biomaterials includes how the deeper insight into biological events and its interplay with nanotechnology may support the development of a generation of novel materials, micro-nano-devices and molecular level approaches suited to solve relevant biomedical problems both for therapy and diagnostics. The conference will provide an excellent opportunity to meet and forge collaboration with large number of experts with diverse specializations including engineering, basic sciences, medical and dental professionals, etc. For the research scholars and students, CRAB 2010 will be an eye opener and an excellent opportunity to meet experts from various institutions in India and abroad."

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Ph:9282500599, Ph:9846152346, Email ID: principal.sse@saveetha.com

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THEME 8
NANO - BIOMATERIALS AND NANAO DRUG DELIVERY

Abstract id:92

BIOCOMPATIBILITY OF ELECTROPHORECTICALLY DEPOSITED NANO TITANIA ON STAINLESS STEEL FOR ORTHOPAEDIC APPLICATIONS

J. Srinivasan[1,2] and T.M.Sridhar[1]

[1]Department of Biomedical Engineering, SMK Fomra Institute of Technology, Old Mahabalipuram Road, Thaiyur Village, Chennai 603103
[2]Department of Biotechnology, Sathyabama University, Chennai 600119, Email: tmsridhar@gmail.com

Surface coating is now widely recognised as an enabling technology of major importance in the successful, effective and efficient exploitation of materials in engineering practice. Surface coatings may be broadly considered as an integral part of the design process, synthesis and fabrication technologies. Electrophoretic deposition is one of the surface modification processes by which charged particles from stable colloidal suspension deposits highly uniform ceramic films in a short period of time. The technique demands no restriction in the shape of the substrate and has characteristics such as rigid control of film thickness, uniformity, deposition rate and low process cost.
Titania (TiO2) is a bioinert material that is non-toxic for and non-absorbable by the human body. Electrophoretic deposition (EPD) was employed to coat TiO2 on AISI type 316L stainless steel (SS) to improve its biocompatibility and corrosion resistance. Coatings were obtained by following two main steps, namely formation of a suspension of the charged TiO2 particles and deposition of the suspended particles on the electrode under the influence of a dc electric field.
In order to establish the best possible parameters for obtaining high quality and reproducible TiO2 coatings, two test series were carried out, varying the deposition time and the applied voltage (4–30 V). Stable suspension of the bath was necessary for obtaining uniform deposits. After EPD, the specimens were carefully extracted from the solution and dried in a controlled humidity atmosphere. During the EPD of TiO2 the electric current decreased continuously with deposition time due to the increase of the electric resistance as deposition progressed. It was possible to observe that TiO2 nanopowder strongly adhered to the planer stainless steel substrate. For constant deposition time, the rate of deposition increased very quickly with voltage. The uniform deposits of TiO2 formed on the surface shown good sintering characteristics and were characterised using X-ray diffraction (XRD) technique. Cytotoxicity assay and biocompatibility by cell growth tests are being carried out to analyzes the coated samples.

Keywords: NanoTiO_2, biocompatibility, 316 L Stainless Steel, EPD, coatings

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Abstract id:91

DEVELOPMENT, CHARACTERIZATION AND BIOCOMPATIBILITY STUDIES OF BIPHASIC NANOHAP COATINGS ON 316L SS

K. Kala[1,2] and T.M.Sridhar[1]

[1]Department of Biomedical Engineering, SMK Fomra Institute of Technology, Old Mahabalipuram Road, Thaiyur Village, Chennai 603103
[2]Department of Biotechnology, Sathyabama University, Chennai 600119, Email: tmsridhar@gmail.com

Trauma, degeneration and diseases often make surgical repair or replacement necessary. When a person suffers from joint pain, the main concern is the relief of pain and return to a healthy and functional life style. This usually requires replacement of skeletal parts that include knees, hips, finger joints, elbows, vertebrae, teeth, and repair of the mandible. Biomaterials are used to repair the damaged body parts that need to last for the lifetime of the patient. The current life expectancy of such implant materials is 10 years and this needs to be doubled or tripled in future. Bioceramics has evolved as an integral and vital segment of our modern health-care delivery system. The full potential is yet to be explored in the years to come. The composition, microstructure and molecular surface chemistry of various types of bioceramics would be tailored to suit the specific biological and metabolic requirements to tissues or diseased states.
The basic calcium phosphate mineral, Hydroxyapatite (HAP) is the prototype of one of the major constituents of bone and teeth. In the present work layers of Biphasic mixture of Bioceramics HAP-TCP in the ratio of 7:3 was coated on the surface of type stainless steel by electrophoretic deposition (EPD) from a 2% suspension in ethanol. The experiment were carried out from 5 -20 V at varying time intervals. The coatings were characterized by FTIR, XRD and SEM studies. The major advantages of EDP technique are control over the composition and structure of the Coat. This process increases the biocompatibility and reduces the rejection ratio and corrosion reactions.
In vitro cytotoxicity of the coatings was carried out in growth medium and the set of concentration was chosen for methyl thiaxolyl tetrazolium (MTT) assay with the Vero cells. The results obtained indicate that even at increasing coating thickness does not affect the activity of cells. The antioxidant property of the HAP was studied by the DPPH (2,2 diphenyl 1 picryl –hydroxyl) and radial scavenging activity using HepII cells. Electrophoretically deposited biphasic nanobioceramics coatings are biocompatibile, have antioxidant property, reduces the rejection ratio and corrosion reactions of orthopaedic 316L SS implants.

Keywords: HAP, 316L SS, electrophoretic depoisiton, biocompatibility, cytotoxicity

Abstract id:90

SYNTHESIS, GROWTH MECHANISM AND CHARACTERIZATIONS OF CALCIUM PYROPHOSPHATE DIHYDRATE NANO-PARTICLES

Sonal R. Vasant, Kashmira P. Tank and Mihir J. Joshi

Crystal Growth Laboratory, Department of Physics, Saurashtra University, Rajkot-360 005, Gujarat, India, E-mail: sonalvasant@rediffmail.com

Pyrophosphate bio-materials have attracted the widespread attention due to its application in biology and medicine as they can interact with biological systems. Calcium Pyrophosphate (CPP) – a type of calcium phosphate and a shortest linear polyphosphate can also be used as a bone graft and in dentistry. Successive applications of theses

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materials depend on the degree of bio-resorption, mechanical strength and bio-compatibility. In the present study CPP nano-particles were synthesized by using surfactant mediated approach. An attempt was made to study the role of the surfactant in the growth mechanism. The crystalline nature and average crystallite size was studied by Powder XRD. To study the effect of strain Williamson-Hall method was used. The TEM study indicated that nano particles were in the range from 4 nm to 40 nm. The presence of various bonds was confirmed by FT-IR spectroscopy. The amount of water of hydration and the thermal stability was studied by Thermo-gravimetry. Formation of other phases on heating CPPD at 900 0 C and 1250 0 C were identified by the Powder XRD. The results are discussed.

Keywords: Thermo-gravimetry

Abstract id:81

SCOPE OF NANOTECHNOLOGY IN CONSERVATIVE DENTISTRY "IT IS THE BEGINNING OF THE JOURNEY NOT THE FINAL DESTINATION"

C. V. Subba Rao, Sindhu Ramesh

Dept. of Conservative dentistry & Endodontic

The advances made in science have catipulated nanotechnology from its theoretical foundation straight into reality. Dentistry also facing major revolution in the wake of this technology having already been targeted with novel nano materials.
In conservative dentistry, utilization of nano particles in composite resin has given rise to a new class of materials with improved properties over micro and macro filled composites. The incorporation of nano fillers reduces the polymerization shrinkage, thermal expansion, and contraction. Further it also enhances polishing ability of the composite , increases the hardness and wear resistance.
Nano fillers have been incorporated in dental adhesives to improve the adhesion both to enamel and dentine to maintain the marginal integrity and to reduce the post operative sensitivity.
Further the research and development of nano robotics would revolutionize dentistry. Thus the nano technology plays a vital role in not only improving the properties of existing materials but also in developing and fabricating new materials with desired physical, mechanical and chemical properties.
This paper highlights the some of the aspects of nanotechnology and its clinical application in conservative dentistry.

Keywords: shrinkage, thermal expansion, and contraction

Abstract id:78

INCORPORATION OF SILVER NANOPARTICLES ON TO THE CELLULOSE-FIBRIN COMPOSITE AND ITS ANTIMICROBIAL ACTIVITY

T.P.Sastry and I.Niyas Ahmed

Department of Bioproducts, Central Leather Research Insitiute(CLRI), Chennai

Nanotechnology is expected to open some new aspects to fight and prevent diseases using atomic scale tailoring of materials. The integration of nanomaterials with biology has led to the development of diagnostic devices, contrast agents, analytical tools, physical therapy applications, and drug delivery vehicles. In all the nanomaterials with antibacterial properties, metallic nanoparticles are the best. A novel dressing material was prepared using Cellulose and Fibrin by employing regenerative technique. Silver nanoparticles also incorporated in this composite. This Silver nanoparticles loaded cellulose-fibrin composite (C-Fb-Ag) was characterized for its mechanical property, FTIR

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Spectroscopy, thermo gravimetric analysis (TGA), scanning electron microscopy (SEM) and antimicrobial activity was studied.

The results have shown coating of fibrin on the cellulose fibers and incorporation of Ag-nanoparticles on its surface is also evident and C-Fb-Ag pronounced antibacterial activity against all the three bacterium were studied. Studies were carried out on both gram-negative (Escherichia coli & Pseudomonas Aeroginasa) and gram-positive bacteria (Staphylococcus aureus) were subjected to analysis to examine the antibacterial effect of the C-Fb-Ag. The antibacterial effect of C-Fb-Ag is independent of acquisition of resistance by the bacteria against antibiotics.

Key Words: (Staphylococcus aureus), C-Fb-Ag

Abstract id:70

NANOTECHNOLOGY IN TARGETED DRUG DELIVERY

Maneesha Das, Tamilazaghan, Sindhu Ramesh, C.V. Subbarao

Department Of Consevative Dentistry And Endodontics, Saveetha Dental College And Hospital, Saveetha University,Chennai-77

Nanotechnology is a fast expanding area of science. The use of nanotechnology in drug delivery in vivo has been tremendously successful in the field of medical sciences. In dentistry, nanotechnology has been especially used in diagnosis and treatment of oral cancer and other pathological lesions.
One of the challenges with current treatment modalities is how to deliver drugs to lesions and tumours without causing debilitating side effects. By delivering drugs in a more targeted way, some of the side effects are reduced.
Researchers have used nano particles in order to increase the effectiveness of the drug administered. Nano particles have novel optical, electronic and structural properties that are not available either in indivisual molecules or bulk solids. Nano particles serve as customized targeted drug delivery vehicles capable of ferrying large doses of chemotherapeutic agents into the malignant cells while sparing healthy cells.
Such “smart” nano devices hold the possibility of radically changing the practice of oncology, allowing easy detection and treatment at the earliest stages of the disease.

Key Words: pathological lesions

Abstract id:64

NANO-SIZED SILICON DIOXIDE ON THE ACTIVITIES OF THREE FUNCTIONAL PROTEINS

S. Kumaran[1], A. Kavitha[2], C. Chellaram[1] and T. Prem Anand[1]

[1]Department of Biomedical Engineering and [2]Department of Chemistry, Vel Tech Multi Tech Engineering Dr. Rangarajan Dr. Sakunthala Engineering College, Avadi, Chennai-600062, Email: gms.kumaran@gmail.com, Kavinive2007@gmail.com

Nanomaterials are finding increasing use in industrial production and daily life. However, human exposure to them may cause health risks. Nano-SiO2 was selected as a representative nanomaterial and its potential effects were investigated in terms of its interactions with cytochrome c (cyt c), deoxyribonuclease (DNase II) and hemoglobin (Hb). The interactions accorded with Langmuir isothermal adsorption; the saturation binding numbers for cyt c, D Nase II and Hb were 42±5, 24±2 and 1.1±0.1_mol/g nano-SiO2 particle at pH 7.4, respectively, and the corresponding stability constants were 6.15×105, 1.79×106 and 2.6×107M−1. The interactions also changed the secondary structures of the

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proteins and inhibited their static and dynamic activities. It may reasonably be deduced that exposure to nano-size silicon dioxide particles e.g. as drug carriers may have an unfavorable effect on human health by inactivating functional proteins.

Key Words: deoxyribonuclease (DNase II), haemoglobin

Abstract id:52

TOXICOLOGICAL CONSIDERATION OF PHARMACEUTICALLY USEFUL POLYMERIC NANOPARTICLES

U. M. Dhana Iekshmi, Narra Kishore, P. Neelakantareddy

Bio Organic Laboratory, Central Leather Research Institute, (Council of Scientific & Industrial Research), Adyar, Chennai 600020. India, E mail: dhanamum@yahoo.co.in

Nanosized materials have tremendous application in every field of human activity, with a lot of economic benefit increasing nanoparticle research and use. There are number of nanosized products already available commercially and many others are in queue. Non biodegradable and partially biodegradable nanoparticles are of greater concern for causing different types of complications related to human health. Therefore precautionary course of action to determine the toxicity for medicinally important manufactured polymeric nanoparticles is necessary to safe guard the health and safety. In contrast to many efforts aimed at exploiting desirable properties of nanoparticles for medicine, there are limited attempts to evaluate potentially undesirable effects of these particles when administered intentionally for medical purposes. Therefore, there is a pressing need for careful consideration of benefits and side effects of the use of nanoparticles in medicine. This research work aims at providing a balanced update of this exciting potentially toxicological effect of manufactured polymeric nanoparticle. To assess the toxicities systematically on the functions of various tissues and organs in rats, the rats were fed with the manufactured polymeric nanoparticles. Variation in the protein, carbohydrate and fat metabolic profile of the rat exposed to nanoparticles were studied. The diversity of engineered nanoparticles and of several possible side effects represents one of the major challenges for nanopharmacology and therapeutics.

Key Words: nanoparticles, toxicity, health, safety

Abstract id:116

MEMRISTORS FOR NANO-BIO-SENSING

M.Ravindiran[1], K. Udayalakshmi[2], K. Senthilkumar[3]

[1,2]School of Engineering, Saveetha University, Chennai, India
[3]Dr. M. G. R. University, Chennai
Email: [1]ravmun@gmail.com, [2]udayalakshmi@gmail.com, [3]ksenthilkumarice@gmail.com

Memristor plays a predominant role in nano-electronics which is being a part of the nanotechnology. It is the fourth passive device as Capacitor, Inductor and Resistor. The combined functionality memory and resistor were adopted in the Memristor concept, were resistance is the function of the current through the device and voltage across the device. Application of memristor varies in different areas in electronics and also in the filed of Bio-sensors. Various electronic devices are used in Bio-Sensing applications such as Thin film Transistor for measurement of pH. DNA-FET (Field Effect Transistor) plays an important role in analyzing the DNA sequence and Detection of DNA Hybridization. Similar to DNA-FET another electronic device Dielectric Modulated Field Effect Transistor (DMFET) is also used for label free DNA detection. Novel nano-biosensors are used for Early, Accurate and Non-invasive Melanoma and other type of cancer detection. The further enhancement in the field of Biosensors could be accomplished with the new device in the

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modern era of Electronics which is Memristor based Nano Bio-sensing, were the charge from the molecules would affect the memristic effect when placed in the channel layer. This change in the memristic effect would be due to the Nano-material used and the fabrication technique adopted for the fabrication of the device.

Abstract id:119

APPLICATIONS OF NANOTECHNOLOGY IN ENGINEERING

Sona R[1], Karthik Somasundaram[2]
[1,2]IV year B.E.Biomedical Engineering
[1,2]Rajalakshmi Engineering College, Thandalam, Chennai – 602105, Email: [1]s19rams@gmail.com, [2]ksomu1989@gmail.com

The objective of this paper is to focus on the applications of nanotechnology in the emerging field of bioscience. Among the several applications of nanotechnology in this field, here we focus on two innovative applications, viz. (i) Tumbleweeds in bloodstream, and (ii) Nanotechnology vision chip. The former deals about how molecular sensors which when injected into the bloodstream could warn astronauts regarding health impacts due to space radiations. The latter deals about the unique technology used to stimulate retinal neural cells using an array of carbon nanotubes. This is applicable in medical conditions such as restoration of vision in patients suffering from age-related macular degeneration, the number-one cause of blindness in the elderly. Other potential applications include traumatic eye damage and ophthalmologic research.

Key Words: tumbleweeds in the bloodstream, nanomanufacturing, nanotechnology vision chip, carbon nano tubes, dendrimers

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