Dr. M. Rajan
Assistant Professor
Department of Natural Products Chemistry
Mobile No: +91 9488014084
Email: rajanm153.chem@mkuniversity.org

Biomaterials Medicinal Chemistry Laboratory, Department of Natural Products Chemistry, School of Chemistry, Madurai Kamaraj University

Background

The twentieth century was a milestone in the field of biomaterials because most of the currently used biomaterials and surgical implants were developed in this period. As we enter the era of nanotechnology, the field of biomaterials is becoming one of the most promising areas with assured novel products to alleviate the pain and suffering of mankind. Even though activity in this field is not new, there is currently fresh energy in this subject brought about by the convergence and remarkable advances in nanotechnology and biotechnology. This includes the development of the next generation of biomaterials by the so called tissue regeneration approach. Nanobiomaterials possess superior properties over their microscale counterparts. For example, nanocrystalline hydroyapatite promotes osteoblast cell adhesion, differentiation, and proliferation, osteointegration and deposition of calcium-containing minerals on its surface better than microcrystalline HAP, which leads to the formation of new bone tissue within a short period. Another upcoming strategy is to design nanomaterials to encapsulate, target, and deliver from small molecules to large molecules to a specific tissue site, which could contribute immensely to the eradication of cancer morbidity or the cure of other diseases. The benefits of biomaterials compared to traditional grafts include availability, sterility, safety, reproducibility, cost-effectiveness, and reduced morbidity. Invention of novel biomaterials, with the help of advancements in biomedical science and technology, has dramatically changed the patient's lifestyle in the past few years. The invention of biomaterials signicantly improves the health of the patients. In addition, it opens many industrial positions. Since biomaterials is a multidisciplinary field of applied research. The Biomaterials Medicinal Chemistry Laboratory (BMLC) is working the development of drug carrier system for cancer, tuberculosis & ophthalmic diseases treatment, design & development of bone implant metal plate with coating of bone mimic biomaterials and development of adsorbent, membrane for toxic chemical removals. Since, the main objective of this BMCL as follows

The general objective of the initiative is the qualitative and quantitative improvement of Scaffolds, implants and Drug carrier for the application in in-vitro and in-vivo level through the availability of particular equipments for nanomaterials preparation through various techniques using the following equipments. To obtain specialist medical materials in a whole some synthesis and fabrication in terms of designing, Synthesis and available special equipments are required

- Ultra Sonicator (Sonics, Germany)
- UV Visible Spectroscopy (Shimadzu, Japan)
- Lyophilizer (SSIPL-LYF/065/071216),
- Electro spinning mechine
- DC power supply (Ablab, L1282, 1-128 V)
- Centrifuge

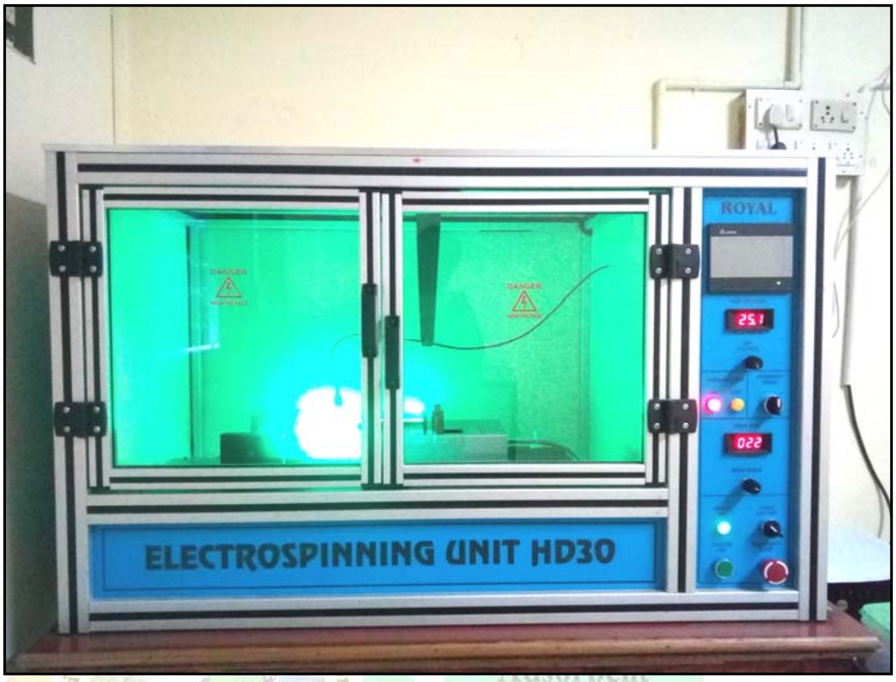
(a) Ultra Probe Sonication Method

The nanomaterials are prepared by Top down approach of nanotechnology By Applying Different Pulse time the size-reduce of material can reduced. High shear forces created by ultrasonic cavitation have the ability to break up particle agglomerates and result in smaller and more uniform particles sizes. The stable and homogenous suspensions produced by ultrasonics are widely used in many industries today. Probe sonication is highly effective for processing nanomaterials (carbon nanotubes, graphene, HAP, HAP/PCS and mineral substituted HAP/ PSSG etc.) and Sonicators have become the nanotechnology standard for Dispersing, Deagglomerating, Particle size reduction, Particle synthesis and precipitation and Surface functionalization.

(b)Lyophilization Method

Nanoparticles have proven valuable to the nanomaterials as part of drug delivery systems, but long-term storage often causes instability to those systems. Freeze drying nanoparticles also helps preserve a solution’s homogenous properties and achieve targeted particle size. The spending trend is still going upwards. Drying is an indispensable operation in the fabrication of nanosized materials. Freezing was found to be a very important step in obtaining desired particle size and properties. Synthesis of nanoceramics is a subject that has attracted much attention. The uniformly distributed particle size out of the freeze-drying process is a desired property of the nanoceramics.

(c)Electro-spinning method

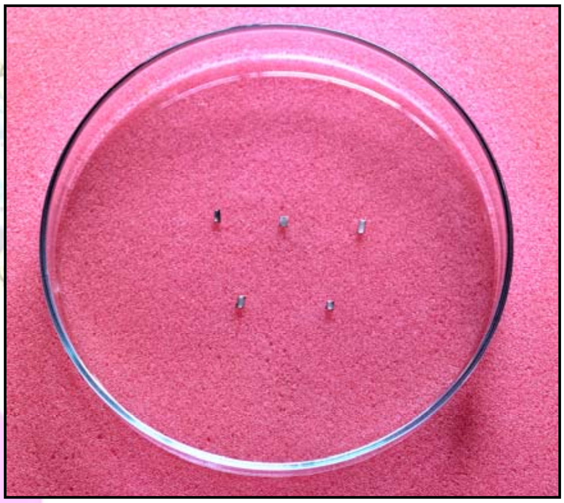


Tissue engineering recovers an original function of tissue by replacing the damaged part with a new tissue or organ regenerated using various engineering technologies. This technology uses a scaffold to support three-dimensional (3D) tissue formation. Conventional scaffold fabrication methods do not control the architecture, pore shape, porosity, or interconnectivity of the scaffold, so it has limited ability to stimulate cell growth and to generate new tissue.

Electrospinning is a unique and versatile technique that depends on the electrostatic repulsion between surface charges to constantly draw nanofibers from viscoelastic fluids. Polymers, ceramics, small molecules and their combinations are used as rich materials for the production of nanofibers. In addition to solid nanofibers, a secondary structure of nanofibers—including porous, hollow or core-sheath structures has been manufactured and the surface of the structure can be functionalized with different molecular moieties, during or after the electrospinning process

(d)DC-Power supply (Electrophoretic deposition & Anodization)

Electrophoretic deposition is an interesting electrochemical method for processing bulk and coating materials, mainly ceramics. Examples of electrophoretic deposition of almost any material class can be found, including metals, polymers, carbides, oxides, nitrides, and glasses: EPD appears of particular interest in surface modifications of materials for biomedical application, because it allows the deposit of ceramic and organic/inorganic coatings with high purity on complex geometries and shapes. Electrophoretic deposition is a two-step process by which the particles suspended in a colloid solution are collected onto a substrate. Deposition takes place in an electrochemical cell in which one of the electrodes is the substrate to be coated. These include simplicity, flexibility, low processing temperature, control of high phase purity, greater homogeneity, controllable chemical composition, and can produce high quality and thin surface coatings. On the other hand, this process has its own limitations too; weak bonding, low wear resistance, high permeability, and control over porosity are notable examples. The sol-gel-derived HAP powders have ne particle size, resulting in low densification temperature, and a good microstructure suitable for host tissue recognition upon implantation.



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