Available online at www.scholarsresearchlibrary.com

Scholars Research Library

European Journal of Applied Engineering and Scientific Research, 2023, 11 (2):1-2
(http://scholarsresearchlibrary.com/archive.html)

ISSN: 2278-0041

A Biodegradable Polymer-Based Nanocomposite for Medical Applications: Its Fabrication and Characterization

Ioannis Coolen*

Department of Biological and Marine Sciences, University of London, Senate House, United Kingdom

***Corresponding Author:** Ioannis Coolen ,School of Biological and Marine Sciences, University of London, Senate House, United Kingdom, E-mail: coolen@ioams.edu*

***Received:** 01-Mar-2023, Manuscript No. EJASER-23-92881; **Editor assigned:** 03 -Mar-2023, Pre QC No. EJASER-23-92881(PQ); **Reviewed:** 17- Mar- 2023, QC No. EJASER-23-92881; **Revised:** 24-Mar-2023, Manuscript No. EJASER-23-92881(R); **Published:** 31-Mar-2023, DOI: 10.36648/2278-0041.1.11.1.012*

DESCRIPTION

Biodegradable polymers have drawn a lot of interest due to their sustainable and environmentally friendly properties. These polymers are biocompatible, renewable, and can be easily degraded by microorganisms, making them an ideal alternative to conventional plastics. Nanocomposites, on the other hand, have excellent mechanical and thermal properties, and their incorporation into biodegradable polymers can improve their mechanical, barrier, and biodegradation properties.

Fabrication

The fabrication of the biodegradable polymer-based nanocomposite involves the preparation of the polymer matrix, the incorporation of the nanoparticles, and the blending of the components. In this study, Poly Lactic Acid (PLA) was used as the polymer matrix, and Cellulose Nanocrystals (CNCs) were used as the nanoparticles. CNCs were obtained from the hydrolysis of cellulose fibers, and their size was reduced to the nanoscale using a mechanical treatment. The CNCs were then dispersed in a PLA solution using sonication to obtain a homogeneous dispersion.

The blending process was carried out using a twin-screw extruder, where the CNCs-PLA dispersion was fed into the extruder along with the neat PLA pellets. The extruder was operated at a temperature of 180-200°C and a screw speed of 100-200 rpm to ensure complete mixing and dispersion of the CNCs in the PLA matrix. The resulting nanocomposite was then cooled and pelletized for further characterization.

Characterization

The characterization of the biodegradable polymer-based nanocomposite was carried out using various analytical techniques, including Transmission Electron Microscopy (TEM), X-ray Diffraction (XRD), Differential Scanning Calorimetry (DSC), Thermogravimetric Analysis (TGA), and Mechanical Testing (ML).

The chemical composition of the biodegradable polymer-based nanocomposite can affect its mechanical and degradation properties. Therefore, it is essential to identify the chemical components of the material using techniques such as Fourier-Transform Infrared Spectroscopy (FTIR), X-Ray Photoelectron Spectroscopy (XPS), or Nuclear Magnetic Resonance (NMR).

The morphology of the nanocomposite is critical for its mechanical and biological properties. Scanning Electron

Citation: *Coolen I. 2023. A Biodegradable Polymer-Based Nanocomposite for Medical Applications: Its Fabrication and Characterization. Euro J Appl Eng Sci Res.11:012*

Microscopy (SEM) and Transmission Electron Microscopy (TEM) can be used to determine the size, shape, and distribution of the nanoparticles in the nanocomposite.

The mechanical properties of the nanocomposite can be determined by techniques such as tensile testing, compression testing, and Dynamic Mechanical Analysis (DMA). These tests can evaluate the strength, elasticity, and deformation behavior of the material.

The degradation behavior of the biodegradable polymer-based nanocomposite can be characterized using techniques such as Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), and Gel Permeation Chromatography (GPC). These tests can provide information on the rate and mechanism of degradation

Biocompatibility is crucial for medical applications of the nanocomposite. Cell viability, proliferation, and adhesion can be evaluated using in *vitro* tests, such as MTT assay and cell culture experiments. In *vivo* studies, such as animal Models, can also be used to assess the biocompatibility and biodegradability of the nanocomposite.

Applications

The biodegradable polymer-based nanocomposite has potential applications in various fields, including packaging, agriculture, and biomedical engineering. The improved mechanical and barrier properties of the nanocomposite make it suitable for food packaging, where it can replace conventional plastics. The nanocomposite can also be used as a coating material for agricultural films to improve their barrier properties and extend their lifespan. In biomedical engineering, the nanocomposite can be used for drug delivery and tissue engineering applications due to its biocompatibility and biodegradability properties.