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Natural Polymer's Applications in a Wide Range of Fields

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INTRODUCTION

Since many years ago, the use of polymers as sustainable goods for improving life quality has been thoroughly researched and effectively implemented. Successful uses have been made of the well-known polymer products for pharmaceutical and biomedical applications in controlled drug release or the cutting-edge techniques for polymer-based medicines. Modern existence is heavily reliant on polymers. Additionally, the most recent advancements in nanotechnology provide fresh opportunities for creating Nano scale materials with significant uses in biology, agriculture, and the environment. This scientific method has several benefits since; In particular, polymeric Nano composites bring interdependence between the matrix and reinforcing components. Fabrication of polymeric nano composite materials falls within the umbrella of polymer nanotechnology. The compatibility of two phases (continuous matrix and discontinuous reinforcement) is a crucial factor. Agglomeration and potential clustering of reinforcements in polymeric matrixes must be avoided in the case of nanoparticle dispersion. It goes without saying that the applications and desired qualities of the polymeric Nano composites influence the choice of nanoparticle kinds. The sole-gel process, co-precipitation, chemical reduction, reverse micellar synthesis, micro emulsion, hydrothermal process, laser pyrolysis, or laser ablation are only a few examples of the several known synthesis methods for polymeric Nano composites [1].

DESCRIPTION

Due to garbage disposal on land and in the oceans as well as other environmental degradation, the present trend of employing plastic material in the creation of packaging items poses major environmental problems. Due to their biodegradability, biocompatibility, benign qualities, and widespread availability, natural polymers including cellulose, starch, chitosan, and protein derived from renewable resources are being thoroughly investigated as alternatives to plastics. Natural polymers' tensile and water vapour barrier qualities, as well as their effects on the environment, were major factors in deciding whether or not these materials were suitable for packaging applications. The tensile and water vapour barrier characteristics of natural polymers were diminished by their brittle behaviour and hydrophilic makeup. However, the mechanical and water vapour resistance qualities were significantly enhanced by the addition of plasticizer, cross linker, and reinforcing agents. Packaging films made of natural polymer-based materials now have better tensile strength and water vapour barrier qualities because to Nano cellulose's high interfacial adhesion and dispersion capabilities. These composite films maximum tensile stress was between 38% and 200% higher than that of films without reinforcement. With the addition of Nano cellulose reinforcement, the water vapour barrier qualities of composite films were also lowered by up to 60%. Strong hydrogen bonds between natural polymers and nano cellulose minimised chain movement and up to 100% reduction in elongation at break [2].

Applications based on polyphenols that are conceptually investigated and physically implemented for usage include bio adhesives. The nucleophilic addition of amine groups from amino acids on adhesives is thought to be the cause of the high tissue adhesion between bio inspired adhesives and tissue. Here, an electrophile reaction occurs between a catechol groups that has the potential to spontaneously rearrange into quinine. The secondary modification of implant materials broadens the use of these materials, and the interfacial engineering of biomedical implants is crucial for enhancing biocompatibility. Due to its innate molecular adhesive capabilities, polydopamine and other polyphenolic multifunctional coatings have been embraced as tools for the interfacial engineering of biomaterials [3].

Due to its special qualities, including biodegradability, biocompatibility, non-toxicity, anti-bacterial effect, hydrophilicity, and structural resemblance to glycosaminoglycans (GAG), a significant component of ECM, chitosan (CH), a naturally occurring linear polysaccharide obtained from chitin by alkaline deacetylation, is an appealing material for tissue engineering. Compared to other synthetic/natural materials, the application

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of chitosan in HVTE has not been as well researched. Comparisons between unmodified chitosan films and three other biodegradable polymers, including gelatin (Gel), poly (lac- tic-co-glycolic acid) (PLGA), and a polyester from the polyhydroxyalkanoates family, were used to assess the specific adhesive properties of unmodified chitosan films and their potential as heart valve substrates against the native Valve Endothelial Cells (VECs) (PHA). Gel and Tissue Culture Polystyrene (TCPS), whose cell activity is well understood, were utilised as positive controls [4].

CONCLUSION

The utilisation of natural polymers and polymeric nano composites has recently demonstrated promising results, particularly when it comes to the removal and/or immobilisation of HMs and related organics from soil and water. Massive environmental problems, such as climate change brought on by carbon emissions, waste management, and water and air quality; compel society to discover long-term solutions for improving living quality. Furthermore, it is necessary to put into practise well-known ideas like sustainable development in conjunction with a circular bio-economy so that biodiversity is not harmed and future generations will have a stable and clean environment. Natural resources that are already available might be utilised to create the next generation of sophisticated materials for specific uses. Additionally, agro-industrial biomass based on polymers or mixes of polymers, or biotechnology used for the manufacture of monomers, offers intriguing natural structures that may be tuned for improved qualities. It is commonly recognised that natural polymers are used in the biomedical, pharmaceutical, and food sectors.

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CONFLICT OF INTEREST

There are no conflicts of interest.

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