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A Review Study of Natural Polymer and Recent Application as a Nano Particle

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ABSTRACT

In this review we are focused on importance of natural polymers and recently natural polymer is key play role in the biomedical sciences. At present time Biopolymer have more advance application as comparatively synthetic polymers .Natural polymers used as a form of starch, chitosan, gelatin and have versatile industries applications like as food, textiles, cosmetics, plastics, adhesives, paper, and pharmaceuticals. The food industry uses these polymers as a thickening agent in snacks, meat products, fruit juices. Application of natural polymer is well knowing like as cellulose layer or wrapping foil was also used fast food, bakery items, and other edible items. This review critically examines the use of natural biodegradable polymers and their drug delivery systems for local or targeted and controlled/sustained drug release against fatal diseases. Natural polymers can be derived from a wide variety of sources, from plants, animals, and microorganisms. Due to their similarity with the extracellular matrix, mechanical adaptation, high biocompatibility, and high water holding capacity, natural polymers–based scaffolds are appealing for skin repair and regeneration purposes.

INTRODUCTION

Polymers are macromolecules which are formed by simple monomer unit and polymers are two type natural polymers and synthetic polymers, polymers are made in the laboratory known synthetic and others present in human being called to natural polymer and utility of natural polymers in human being is used by the literature survey such as polysaccharides, proteins, and nucleic acids, and DNA ,RNA both are present in human body and these are fully responsible for performing a lot of function in human [1]. Natural polymer play a key role in nature due to highly performance and present in human body because a lot of utility is increases due to present of natural polymer like as cellulose [2] and chitin [3] lysozyme [4]. Natural polymer made the highly application in daily life, specially used in Textiles, formation of white paper, cellulose also used in degradable bags which are very useful and past time in our villages maximum utility of the juits and long fiber plant easily available in river and ponds which are very important natural polymers and additive in food product [5-9] natural polymer key play role in drug delivery systems [10-11].

Importance of natural polymer

Natural polymers have an importance in atmosphere and ecologically importance because a lot of utility, which are strongly recommended, they are easily biodegraded in the nature and all the natural polymers are present in the human being organism occurring. Natural polymer generally adopts renewable system after consumption they are easily regenerated although system takes to fully time for regeneration. Natural polymer play a key role in nature as compare to synthetic polymers we know that synthetic polymer are prepare by the chemical and synthetic polymers are none degradable and they are make to highly pollution of the environment. Natural polymer are non toxic chemically and they are not make to pollute. Economic Natural polymers are cheaper and their production cost is less than synthetic material .our fast time is full filled by natural polymer, because everything made by the Natural polymers. Some natural polymers also include DNA and RNA, these polymers are very much important in all the life processes of all living organisms. They are makes possible peptides, proteins, and enzymes in a living body. Enzymes inside the living organisms help the reactions to happen and the peptides make up the structural components of hair, skin, and also the horns of a rhino. The other natural polymers are polysaccharides or called sugar polymers and polypeptides such as keratin, silk, and the hair.

Natural rubber is also a natural polymer which is made of hydrogen and carbon also called is Isoprene.

Origin of natural polymers

Polymers which are made in the laboratory well known the synthetic polymers, but source of natural polymer availability is less than as compare to synthetic polymers, Natural polymers are availability in nature and natural polymer is renewable polymer they are easily available. Natural rubber is generally obtained by the Hevea brasliensis tree. Polysaccharides are found in abundance in nature and are readily available from sources such as algae (e.g. alginates), plants (e.g. pectin, guar gum, mannan), microbes (e.g. dextran, xanthan gum) and animals (e.g. chitosan, chondroitin) and they can also be produced by means of recombinant DNA techniques. Monosaccharide polymers have many favorable properties such as high stability, no toxicity, hydrophilicity, biodegradability, gel forming properties and ease of chemical modification. Polysaccharide part of the plant, each and every part of plants like as the seeds, leaves and roots [12].

Application

Nanocelluloses are mostly used in biopolymeric films for active packing foods (bacterial nanocellulose) [13] Nano fibrils made by cellulose [14-15] other polymeric materials pullulan [16-18]chitosan and agar [19-20] and other useful such as silver nano particle bioactive ionic liquids [16] and natural extracts [19]. An important explanation example are,Esposito *et al* [17]exploited hydroalcoholic extracts from chestnut spiny burs and roasted hazeinut skin obtained from industrial processes. To prepare homogenous pullunan films. Microcrystalline cellulose use as a binder/diluents of tablet, cellulose acetate fibers are used in wound dressings [21] used of the Agar as a suspending medium, emulsifying agent, gelling agent, surgical lubricant, tablet disintegrants, medium for bacterial culture, laxative.agar play important role in bakery products [21]. Gaur gum used as a drug delivery system, Carboxymethyl guar film is used in transdermal therapeutic system. Gaur gum specially used for drug delivery in colon systems and guar gum protect to drug from unwanted microbial bacteria in the intestine. Xanthan gum is widely used in oral and topical formulations, cosmetics, and in food industry as a suspending and stabilizing agent. It has also been used to prepare sustained release matrix table.

Alginate based mesalazine tablets are used for intestinal drug delivery system. And used drug delivery to mucosal tissue, mucoadhesive drug delivery systems. Psyllium used in tablet binding formation. Protein is the one of most important part of the body and protein are formed by the Amino Acids and each and everyone protein linkage to each of the by the polypeptide bonds.

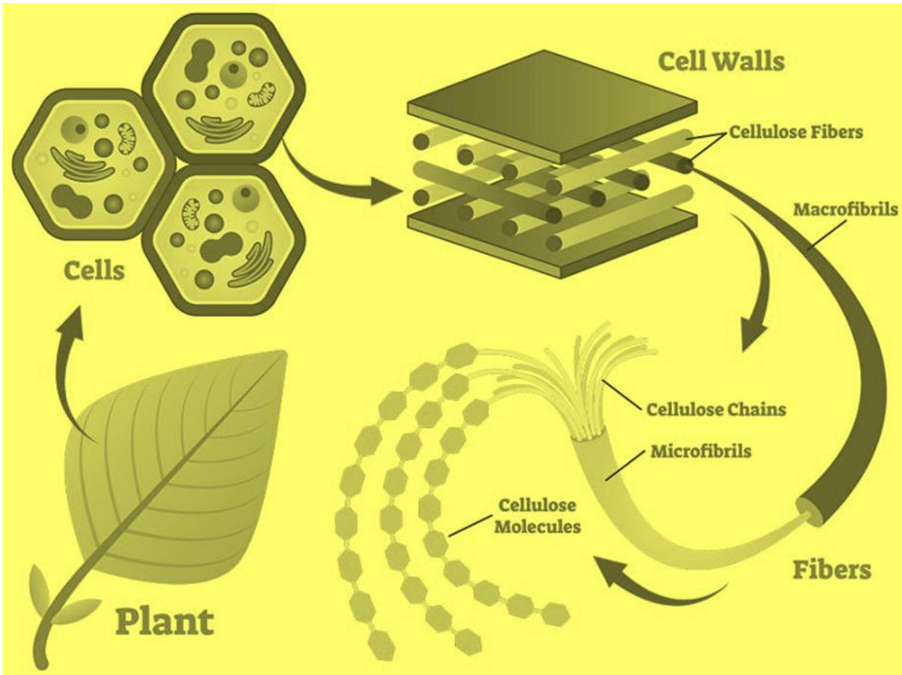

Fig. 1 Natural polymer by Leaf, Source, Google engine

Fig. 2 Guar gum powder

Ion Exchange Membranes for Fuel Cells

Recently great attention generated by polymer electrolyte fuel cell component, recently focused by Vilela *et al* [22] .In particular, BNC-based materials have been studied for the development of sustainable substitutes of ion-exchange membranes. The lack of intrinsic ionic conductivity of BNC can be surpassed with the introduction of ion-conducting phases in the cellulose nanofibrillar structure[22].In this sense, BNC has been combined with synthetic polyelectrolytes, such as Nafion^{TM}[23] poly(4-styrene sulfonic acid)[24-26] phosphate bearing monomers[27-28] and poly(ionic liquids) [29] to create partially biobased separators. Particularly relevant is the partnership between BNC and natural polyelectrolytes[30-31]for the design of mechanically and thermally robust fully biobased Polymer Electrolyte Membranes (PEMs). Fucoidan and BNC membranes [31,32].

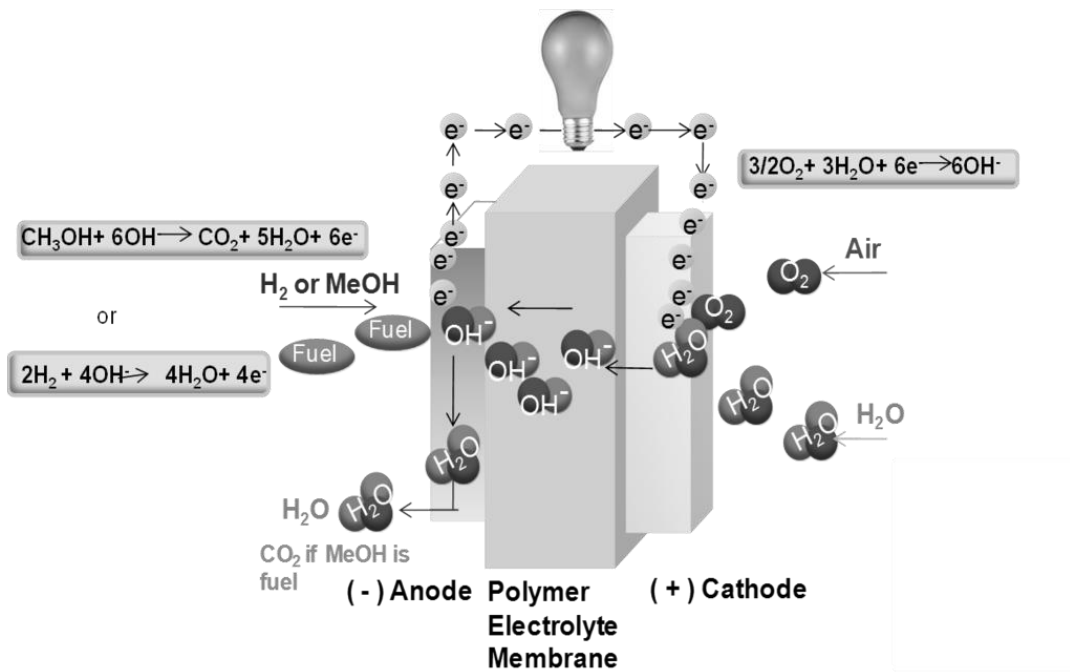

Fig.3 Ion exchange membrane, made by Polymer

Alkaline Fuel Cells (AFCs) are based on the transport of alkaline anions, usually hydroxide OH^- between the electrodes. Original AFCs used aqueous potassium hydroxide (KOH) as an electrolyte. The AAEMFCs use instead a polymer membrane that transports hydroxide anions [52-53].

Application in food packing

In past time our ancestors and human which was lived in the deep forest area ,where no any modern facilities available, They are used wooden parts, bamboo parts are mostly useful in their life, shells, animal skin, leaves, grasses, jute, glass, and ceramic [33-36]. Some evidence of primitive pottery and glass used as packaging is dated around 7000 B.C. [34,35] Recently we are entered in modern time and there are so many utility and application are increased with growing to populations and at present time we know that utility of natural polymer are increases. Total production of bioplastics, has reached a total of 2.11 million tons in 2020 and is expected to grow 15% until 2024 [37]. According to the report published in November 2020 by Intrados Globe Newswire [38] the world bioplastics market has generated more than U$4.5 billion in 2019 and it is estimated to reach more than U$13 billion until 2027. To them, the starch-based bioplastics market should totalize U$561 million until 2023, with an annual growth rate (CAGR) of more than 3.5%. The major contribution to the bioplastics market was from the Asia-Pacific region. Europe should have the highest CAGR, more than 16%, until 2027 [38] The distribution by sector of the bioplastics global production market in 2020 [39] is presented in. Thus, the plastics and packaging markets are witnessing a significant increase on demand for materials from renewable resources. Polysaccharides based polymer used to develop natural-based packaging materials [40].

Application in nano drug delivery

Makham have reported Starch nano-particles are used to insulin drug delivered by non invasive technique.[41] In this process protease make a difficult challenge for the Insulin[42-44] a cross linked polymer for transdermal delivery of propanol [45-46]. Das *et. al* have reported that nano particle are not easily degraded by the gastric juice in the human body, they are stable in acidic medium. similarly work reported by Luo *et al* [47-48]. Recently, chitosan and its derivatives have been considered as the best vehicle in the pharmaceutical field due to their biocompatibility, and their non-carcinogenic, non-toxic, antibacterial properties. Chitosan offers a large range of options for industries and scientists for the generation of modified and novel drug delivery systems. Chitosan acts as an auxiliary agent in the therapeutic application for tissue engineering, wound dressing, and sliming. Protonation of the amino group in an acidic medium results in cation formation. Chitosan exhibits unique behavior because of its cationic nature [49-

50] Modification of chitosan and the stability of drugs delivered using chitosan decrease the adverse effects of diseases and increase the biocompatibility of drugs for various diseases [51].

CONCLUSION

In this review, we are find out about the natural polymer based product and what application of natural polymer in medical science, Here we are observed natural polymer having one important nature like as replications and easily they are regenerated. They are making less pollution as comparatively synthetic polymers. They are used as a nano material in human body and they are given key play role in drug delivery systems and many natural polymers are being used from the ancestor time. we know that suture which was prepare by the degradable polymers and they are used as a binding form inside of the body and they are automatically melt in side abdomen many examples like as when pregnant lady is operated in theater, that time biodegradable suture was applied. It is observe that biodegradable polymer-based nano particles have widely used in medical field. They can target infected areas, organs, tumor sites, and tissues in the body. Biodegradable and biocompatible polymers are appropriate materials for the development of novel drug delivery systems. Biocompatibility, mechanical properties, and low cytotoxic effects of these polymers make them an appropriate choice for drug delivery systems. It is the need of time to manipulate the system, which reduces the toxic effects of drugs on healthy organs or body parts. Recently we need to more investigation of nano natural polymer for requirement for diagnosis of cancer cells because cancer cell is fast growing and how we can easily trapped growing cells this is the major challenge for us.

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