J Material Sci Eng 2015, 4:4
http://dx.doi.org/10.4172/2169-0022.S1.023

OMICS International
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International Conference and Exhibition on
Biopolymers & Bioplastics
August 10-12, 2015 San Francisco, USA

Novel phenolic derivatives of pectin: Enzymatic synthesis and properties

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Pectin is a natural biopolymer extracted mostly from citrus peel, sugar beet and apple pomace. In order to improve its functional properties and then to enlarge the field of its potential applications, pectin was functionalized according to two approaches. The first one consists in an oxidative reaction between pectin and ferulic acid (FA) catalysed by *Myceliophthora thermophyla* laccase leading to pectin-F. The second one was based on the physical adsorption of FA-oxidation products (POX) on pectin leading to pectin-POX. The POX was previously obtained through oxidative reaction of FA catalysed by laccase. A comparative study was performed aiming to determine the impact of each functionalization pathway on the structure and the properties of pectin. The modification of the structure of pectin was proved by FTIR and RMN-H methods. The study of the properties showed that the functionalized pectin powders were less hygroscopic and viscous than the native pectin and presented different gelation properties in the presence of calcium ions. A significant improvement of the antioxidant properties of pectin after functionalization was also observed. This trend was even more pronounced in the case of pectin-F. Finally the thermal properties and the structural characteristics of the different pectin samples were shown to be also affected by the functionalization performed. As a conclusion, both approaches led to derivatives with improved properties that could widen the field of applications of pectin.

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Chitosan nanoparticles improving mechanical properties of different pectin-based films: Low and high methoxyl degrees

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The increasing discard of petroleum-based packaging has intensified the environmental impacts. An alternative has been the production of biodegradable packaging from low-cost and renewable polymers. Pectin, a naturally occurring polysaccharide, is widely used to make films but presents unfavorable physical properties compared to synthetic polymers. The addition of nanoparticles was reported to improve the mechanical properties of polysaccharide films. The aim of this study was to add chitosan nanoparticles (CSNPs) on pectin (high or low methoxyl degrees) matrices producing nanocomposites: HDM pectin/CSNPs and LDM pectin/CSNPs films; as well as to evaluate the effect of the nanostructure on mechanical properties. CSNPs were synthetized by ionotropic gelatinization and characterized as to zeta potential, average diameter, and FT-IR. The nanocomposite films were obtained by casting from colloidal solution of CSNP/pectin and analyzed by thickness, appearance, FT-IR, and mechanical properties. The CSNPs presented average diameter near to 110 nm and zeta potential near to 50mV. FT-IR showed the interactions between CS and TPP, representing CSNP formation. By the addition of CSNPs into pectin matrices, nanocomposites were successfully formed, showing good visual appearance. CSNPs improved the mechanical properties, with the tensile strength having the most significant enhancement from 30.81±1.50 MPa to 46.95±0.36 MPa for HDM pectin/CSNP and from 26.07±3.78 MPa to 58.51±11.08 MPa for LDM pectin/CSNP. These results show that nanocomposites produced with pectin/CSNPs have improved mechanical properties compared with control pectin films, allowing these novel materials to stand out as an alternative to food packaging production.

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