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Materials derived from polysaccharides and other renewable resources: exploring sustainable processes

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The use of polysaccharides and other renewable resources results in materials with numerous applications, including packaging, controlled releases, dressings, sensors, ultraviolet light blockers, the transportation industry, and civil construction, among other areas. Implementing sustainable processes in the production of these materials further enhances the development of the circular bioeconomy. In this context, efforts have been made to utilize processes that do not rely on solvents or catalysts. Reactions took place in molds under temperature and pressure, leading to the concomitant formation of composites. Numerous reagents from renewable sources contributed to the process, while lignocellulosic fibers served as reinforcement. Examples include using cellulose (or lignosulfonate) and castor oil to synthesize a bio-based polyurethane matrix, or employing epoxidized soybean oil, citric acid, and cellulose (or lignosulfonate) in creating copolymers with polyester and polyether segments. In both instances, coconut, sisal, or curauá fibers (short fibers or blankets) served as reinforcement. Bio-based polyurethane films were produced concurrently with the respective syntheses using various polyols, including cellulose, ethoxylated-quaternized hydroxyethylcellulose, starch, and chitosan. Hydrogels were formed from the deconstruction of lignocellulosic fibers. Since solvent use is unavoidable in this case, environmentally sound solvents are sought. The obtained composites, films, and hydrogels have demonstrated potential for a variety of applications. All studies are ongoing, and the results available so far are promising.

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References

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