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Cellulose-based Materials: Important Player in the Circular Bioeconomy

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Cellulose-based materials can play a critical role in the circular bioeconomy thriving. Forest biomass is a critical source of cellulose. However, others could be introduced in the specialized market, for example, lignocellulosic biomass, such as sisal, whose fibers have a high cellulose content. Also, the high cellulose content gives such fibers excellent mechanical properties, and, therefore, sisal is considered one of the top plant fibers for reinforcing polymeric matrix composites. Cellulose derivatization, as esterification, has been widely studied and reported in the literature, but there is still room for further exploration. Using cellulose as a macromonomer can lead to promising avenues for future research. Specifically, microcrystalline cellulose is a compelling synthesis option due to its relatively low average molar mass. In the context of those above, there has been an effort from our side to explore the esterification of sisal cellulose, aiming, for instance, to use the products in producing electrospun mats and forming functionalized films, for example, with magnetic nanoparticles. Numerous lignocellulosic fibers have been utilized to reinforce various synthesized bio-based polymeric matrices, emphasizing the application of sisal as short fibers or blankets. Biobased polyurethanes have been synthesized using microcrystalline cellulose as a polyol through multiple processes. The syntheses have formed molded composites reinforced by plant fibers, and films (with or without additives)and using different sources of isocyanate groups. Extensive characterization of all the mentioned materials has yielded promising results. All mentioned studies on cellulose-basedmaterials are in progress, always within the perspective of contributing to advancing thecircular bioeconomy. Studies on cellulose-based materials for application in the sorption ofmetals from water are currently in their early stages.

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