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ABSTRACTS



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PLEN2 - POLYSACCHARIDE-BASED MATERIALS: KEY PLAYERS IN BUILDING A SUSTAINABLE TOMORROW

Sustainable Materials/Circular Economy
Materials & Engineering

Polysaccharide-based materials: Key players in building a sustainable tomorrow

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Polysaccharide-based materials are gaining significant traction in various sectors focused on sustainability and innovation, with a robust growth trajectory projected through 2032 (Fig. 1a). Numerous applications can be cited, including biodegradable packaging with additives for antiviral properties, medical applications, water purification, agriculture, construction, and energy storage. Various research groups in Brazil are engaged in the exploration and development of a range of materials derived from polysaccharides, including antimicrobial and antioxidant materials, production of films using regional polysaccharides, hydrogels, composites reinforced with lignocellulosic fibers (where cellulose is the primary component) among others.

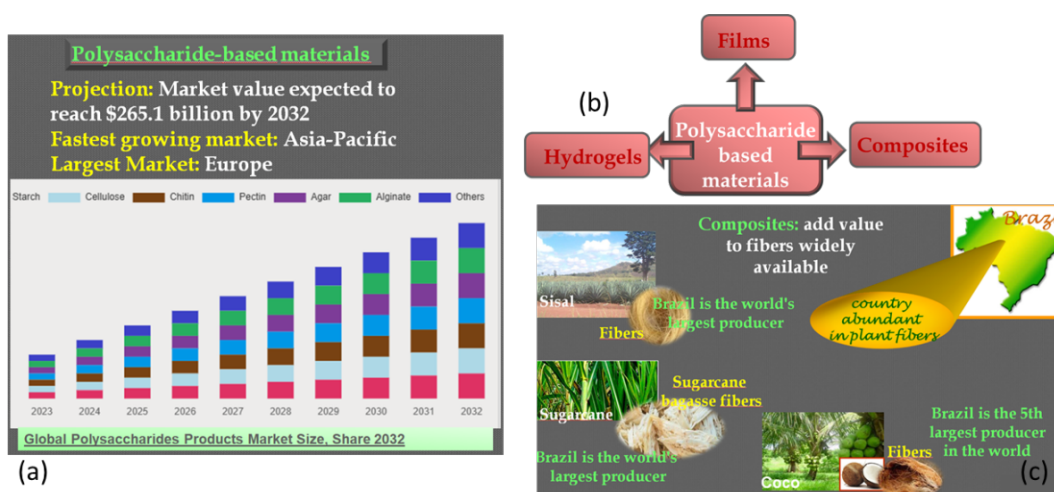


Fig.1. (a)Global market projection for polysaccharide-based (b)Materials investigated at MacromoLignocell (c)Fiber production in Brazil: use in composites

The "MacromoLignocell Group", is currently focusing on developing films, hydrogels, and composites (Fig. 1b), always seeking sustainable processes. Composites are formed parallel to syntheses that occur in molds under temperature and pressure, without solvents, and are reinforced by fibers such as sisal and coconut (Fig. 1c) as short fibers or mats. In the syntheses, the reagents are mostly renewable: (a) cellulose (or lignosulfonate) and castor oil as sources of hydroxyl groups (bio-based polyurethane matrix); (b) citric acid, epoxidized soybean oil, cellulose (polyester/polyether copolymer matrix). Type (a) syntheses are also conducted on the surface of glass plates,

concomitantly forming films with or without additives such as ZnO or SiO₂ nanoparticles, which may include additives like ZnO or SiO₂ nanoparticles. Alongside cellulose and its derivatives—such as quaternized ethoxylated hydroxyethylcellulose—sources of hydroxyl groups have also included starch and chitosan. Solvents are essential to generating hydrogels. The focus has been deconstructing lignocellulosic fibers using solvents for the polysaccharide fraction, keeping the lignin suspended in the medium, aiming at applications in metal sorption from wastewater and controlled release of fertilizers.

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