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Effect of different additives on bacterial cellulose production in PCS rotating disk bioreactor

Francys K. V. Moreira, Luiz H. C. Mattoso, Roberto J. Avena-Bustillos, Tara McHughC
Embrapa Instrumentation, Brazil

Layered double hydroxides (LDHs) are an emerging class of layered solids with tremendous potential for sustainable technologies. LDHs show the overall stoichiometry $(MII)_1-x(MIII)_x(OH)_2An-x/n.mH_2O$, where MII are bivalent metals, MIII are trivalent metals, and An- interlayer anionic species. The hydrophilic nature of LDHs is particularly useful for the development of packaging materials based on polysaccharides as an attempt to create suitable alternatives to substitute petroleum-based plastics. Polysaccharides are promising for these technologies once they are abundant, nontoxic and suffer fast biodegradation. Nevertheless, a wide application of polysaccharide-based plastics is still limited due to their insufficient mechanical performance. This study demonstrates that the range of mechanical properties of pectin (an anionic polysaccharide) films can be extended by incorporating a hydrocalumite(HC)-like LDH ($Ca_{0.75}Al_{0.25}(OH)_2Cl_{0.25}.mH_2O$). Hexagonal HC nanoplates were synthesized by wet co-precipitation, and incorporated into pectin solutions to make transparent bionanocomposite films through the casting method. The reinforcing effect in the bionanocomposites was significant as, for instance, tensile strength increased from 40 MPa to nearly 80 MPa upon addition of HC up to 5 wt.%. This was likely due to the high degree of nanoplate dispersion and favorable filler-matrix interactions, as revealed by SEM and FTIR observations. Pectin/HC bionanocomposites could potentially be applied in food packaging, especially for conditions where great mechanical resistance is a critical requirement.

Biography

Francys Moreira is an engineer with proficiency in natural polymers. He has completed his PhD at the age of 28 years from Federal University of São Carlos. He currently serves as a postdoc at the National Nanotechnology Laboratory for Agribusiness (LNNA) of Embrapa Instrumentation, a Brazilian federal research organization. He has devoted his scientific career to polysaccharides, mastering their physical chemistry and processing. His research interests include biopolymers in general, nanotechnology, organic/inorganic hybrids and bionanocomposites, and multifunctional materials for intelligent/active packaging.

moreira.fkv@gmail.com

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