# Bionanocomposites based on polysaccharides and layered double hydroxides

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Layered double hydroxides (LDHs) are anionic clays that make up some of the most outstanding nanostructured systems for advanced applications [1]. LDHs possess host-guest chemistry, hydrophilicity and null noxiousness regarding the nature of their metals. Due to these attributes, LDHs are promising for developing polysaccharide-based films for packaging applications. However, the dispersion of LDH into polymer matrixes has shown to be challenging [1]. The present study demonstrates that a high dispersion of hydrotalcite-like LDHs [Mg-Al-Cl] in polysaccharide films can be reached by adopting a continuous casting (CC) approach than a slower drying rate non-continuous casting (CNC). Plate-shaped LDH nanoparticles (~100 nm) with varying $Mg^{2+}/Al^{3+}$ ratio were synthesized by co-precipitation at high supersaturation and incorporated (up to 5.0 wt.%) into starch and pectin solutions to produce transparent bionanocomposite films. Characterizations by DRX revealed that intercalation and exfoliation of LDH nanoplates did not occur because of bionanocomposites production through casting. The nanoplate dispersion level into the biopolymer matrices was driven by the interparticle agglomeration of the LDHs. Aqueous LDH suspension was unstable, resulting in sedimentation over time. This behavior was critical for the case of non-ionizable polysaccharides, such as starch. It was confirmed that LDHs are prevented from decanting when the film-forming time is shortened. A greater reinforcement was then observed for all bionanocomposites produced by CC due to a decrease in processing time when compared with BC (~24 h). The processing strategy plays a role in maximizing properties even when LDH-matrix interactions are favorable.

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**References** [1] Evans, D.G. and R.C. Slade, Structural aspects of layered double hydroxides, in Layered double hydroxides. 2006, Springer. p. 1-87.