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HYDROXYPROPYLATED BIOCOMPOSITE OF CASSAVA STARCH AND LIGNOCELLULOSIC AÇAÍ RESIDUE

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Resumo:
Starch has been over the years one of the most promising sources to obtain eco-friendly alternatives for the packaging market. Nonetheless, its intrinsic properties hinder a wide commercial application due to the high moisture sensitivity and low mechanical properties, mainly caused by its intense intra and intermolecular forces, triggering also the retrogradation of starch chains. Hydroxypropylation can be a potential solution to decrease the approximation of chains and, consequently, its water interactions, by grafting propylene oxide groups in the glucose units, allied to reinforcements provided by the lignocellulosic phase. In this work, a biocomposite was prepared straightforwardly with propylene oxide (PO), cassava starch and lignocellulosic açaí residue in an autoclave reactor under pressure and defined temperatures of 115, 125 and 135 °C, molar ratios of 0.4, 0.6 and 0.8 [PO/OHstarch], and fiber content of 0, 5 and 10 w%, following a design of experiments (DoE). Reaction

yields were evaluated by analysis of variance (ANOVA) and observed that higher temperatures and lower molar ratios hindered the graftization of PO molecules, reaching mass gains around 200%. FTIR analysis evidenced the extent of modification by CH3 signal detection with bands at 2970 and 1370 cm-1 regions. SEM images of starch granules after modification showed the absence of native structure, indicating that they were completely gelatinized during the reaction. Therefore, films were prepared, and the results of tensile strength tests suggested that the presence of residual polyol formed during the reaction is plasticizing starch's chains through significant higher elongation at break, from 4 to 8 times compared to the native starch, which is also observed by XRD, where amylose presented higher retrogradation kinetics with the observation of VH structures at 17 and 23° region. Smooth cryogenic fractured surfaces are observed for films through SEM analysis, underlining a stable morphology of the films produced.