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Carboxymethylcellulose obtained from lignocellulosic waste and its use as a biopolymeric matrix

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The increase in the rate of production and accumulation of solid waste and the search for sustainable environmental solutions imposes the need to introduce advanced technologies to manage it efficiently. In this context, this work aims to obtain carboxymethylcellulose (CMC) from lignocellulosic waste and later use it in the encapsulation of liquid smoke and essential oils. Thus, a product of higher value can be obtained from an abundant and readably available waste product of northeastern Argentina`s agroforestal industry. Rice husk samples for this research were provided by a local company. The rice husk was treated in a biorefinery scheme (Acid hydrolysis, 0.3% w/V, 150°C, 30 min; followed by organosolv treatment, NaOH-ethanol-water, 160°C, 60min, and alkaline treatment). Subsequently, CMC was obtained, esterifying the unbleached cellulose obtained from the mentioned raw material, using a modification of the Druvacell method. The unbleached cellulose is pretreated with isopropanol and sodium hydroxide to promote fiber swelling and ionization of hydroxyl groups, and subsequently esterification with monochloroacetic acid. On the other hand, bio-oil was obtained by pyrolysis, at 400 °C for 120 min, from exhausted *Schinopsis balansae* (quebracho colorado) sawdust and the water-soluble fraction produced was refined, representing 34.6% based on the residual biomass fed. Finally, the refined fraction was characterized, to identify the improvement and its quality as liquid smoke to be encapsulated.
The CMC obtained was used as a component, together with sodium alginate, of a biopolymeric matrix to encapsulate the water-soluble liquid smoke and hydrophobic essential oil. The raw material was characterized by determining its structural components, the substituent groups in CMC were recognized by FTIR and the degree of substitution was determined. In the production of microcapsules, using standard methods the performance and efficiency of the process were determined.
On the other hand, the post-treatment rice husk is composed of 94% cellulose, and the rest is lignin and remaining inorganics. From it, it was possible to obtain a crude CMC with a purity greater than 70% and a degree of substitution greater than 0.6. The microencapsulation results show average yields greater than 55% and efficiencies greater than 90% for both encapsulated substances.
With this work carried out, a very abundant residue could be valorized by obtaining CMC and using it in the microencapsulation of two chemically different substances. Good yields and efficiencies were obtained with liquid smoke [1] and essential oil [2], with comparable results with other authors.

Referencias

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