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Fractionation of bio-oils from the pyrolysis of coconut fibers

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In Brazil, the coconut is cultivated mainly in the Northeast region, and the coconut shells are normally wasted in landfills, which means a high environmental impact. The total recovery of this material is interesting not only due to environmental impact but also due to the possibility of use as industial raw material or alternative bio-fuels. In this work, the study of bio-oil obtained by pyrolysis from coconut fibers by GC×GC/TOF-MS was carried out. One of the forms for recovering waste materials is its pyrolysis. This procedure transforms ligno-cellullosic biomasses into liquids (bio-oil), solids (biochar) and gases. The main questions are: Which products and what amount obtained of these products, can be produced by pyrolysis of one special biomass? For this propose, it is necessary to implement a better condition for the pyrolysis and to characterize the main products completely. In this work, the residual fibers of coconut were subjected to fast pyrolysis, producing bio-oil and this bio-oil was submitted to a fractionation in column, using Amberlyst A-27TM ion-exchange resin as stationary phase, and the fractions obtained were characterized by GC×GC/TOF-MS. This procedure was done as a manner to simplify the complexity of the original bio-oil. Before the fractionation, 277 compounds were tentatively identified in the bio-oil. It was verified that 57% of the area on the chromatogram of bio-oil was composed by phenols, 17% by ketones and 12% by aldehydes. After the pre-treatment with the ion-exchange column, the non-polar fraction showed 252 compounds that were tentatively identified, showing mainly hydrocarbons (20%) and esters (14%), besides presenting some phytosterols that were not detected in the untreated sample. In the polar fraction, 164 compounds were tentatively identified, whose phenols corresponded to 50% of area, followed by aldehydes (15%) and acids (12%). The fractionation was essential for the enrichment of fractions in specified classes of compounds, specially separated in non-polars and polars. These compounds are important for different industrial uses e.g. hydrocarbons and esters have potential to be used as fuel while phenols can be used as a raw material for laminate industries and manufacturing of special chemicals, as phenolic resins. This indicates that coconut fibers have the potential to be a cost-effective and promising alternative to obtain new products and minimize environmental impact.

Biography

Débora Tomasini has completed her PhD from Federal University of Rio Grande do Sul and has experience in Analytical Chemistry. She is a Post-doctoral Researcher at the same University, working with the characterization of bio-oils using different chromatographic techiques.

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