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QUALITATIVE SCREENING OF CATALYTIC PYROLYSIS WOOD-OIL BY MEANS OF GC×GC-TOFMS AND SOFT IONIZATION

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Abstract

The use of lignocellulosic biomass to produce chemicals and fuels through pyrolysis has gained increased attention in the last decades due to its abundance, renewable nature, and composition. During biomass pyrolysis, catalytic processes are needed to increase the H:C ratio of the products since oxygen-containing compounds limit the use of the oil as fuel due to its corrosion properties and instability. Here, bidimensional gas chromatography (GC×GC) coupled to time-of-flight mass spectrometry (TOFMS) and supported by soft ionization has been exploited for the characterization of volatile and semi-volatile compounds in catalytic pyrolysis wood oil. The conventional, nonpolar at 1D and a polar at 2D, column set even promoted a structure-ordered chromatogram, especially in terms of naphthenes and aromatics, the reverse-phase combination allowed to better solve oxygenated compounds, which were previously gathered eluted with neighboring aromatics peaks. By understanding the soft ionization spectra insights into the structure of phenol monomers were achieved and a group-type analysis was obtained thanks to the detection of the molecular ion by photoionization (PI). A range of aromatics (mono; di; tri) and naphthenes have been identified in wood-derived oil and the presence of phenols was readily different in bio-oils derived from catalytic pyrolysis processes. This approach allowed explaining the bio-oil composition and checking the efficiency of catalytic pyrolysis that has been applied to reducing the concentration of the oxygenated compound and obtaining a biofuel that could be used as an alternative to fossil-based fuels.