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GC×GC/qMS in the analysis of bio-oils from pyrolysis of biomass

In this work, the main results of the use of comprehensive two-dimensional gas chromatography (GC×GC) in the analysis of bio-oils derived from biomass pyrolysis coming from Brazilian biodiversity, will be discussed. The first part of our research involved the characterization of bio-oils from sugarcane straw and rice husk. From these biomasses, methods of research were defined according to biomass structure (using thermo-gravimetry and infrared spectroscopy) which allowed classifying them into different groups with different bio-oil composition. Then, we began to work not only with the original purpose (generation of biofuels), but with the possibility of using this material as a source of raw materials for the chemical industry. Aiming this objective, the biomasses chosen for this study were: Sugarcane straw, rice husk, peach kernel, coconut fiber, palm fiber, coffee residue, tobacco seed, *crambe* seed, furniture industry waste, and pulp and paper industry waste among others. The use of GC×GC allowed the identification and semi-quantitation of several products from the studied biomasses. In addition, the structured presentation of results allowed the identification of a much larger number of compounds, compared with the literature, for these classes of compounds, and even solving problems of unclear identification due to co-eluting compounds. This technique allows a separation in two-dimensional space using two columns of different polarity and also has the possibility of increasing the identification through the construction of curves (dispersion graphics) which can be extrapolated to families of compounds. Thus, in all biomasses studied, high levels of oxygenated compounds, mainly phenols derived from lignin were found. In biomass group, most lignocellulosic material (wood derivatives, straw and peel) were found with high levels of ketones and furans (derived from cellulose). In biomass derived from oilseeds (palm oil, *crambe*), acids and fatty esters, undecomposed and lighter acids were found, depending on the pyrolysis temperature. The tobacco and coffee biomasses, produced bio-oils with high nitrogen content, especially pyridines. Another important factor considered was the use of catalysts. These were tested in the biomass sugarcane straw and wood waste, increasing, significantly, the amount of hydrocarbons (saturated and aromatic). Thus, it can be concluded that the GC×GC technique allows a complete characterization of bio-oils generating data for their potential industrial use.

Biography

Claudia Alcaraz Zini is an Associate Professor in the Institute of Chemistry of the Universidade Federal do Rio Grande do Sul and works in the field of Analytical Chemistry, mainly with sample preparation techniques, one-dimensional gas chromatography and comprehensive two-dimensional gas chromatography with mass spectrometric detection applied to the extraction and analyses of volatiles and semi-volatile compounds in complex matrices. Complex matrices investigated are mainly related to wines, fruit juices, food and beverages, plants, essential oils, pyrolytic liquid phases (raw bio-oil, bio-oil, aqueous phase), petroleum, coal extracts, infochemicals, etc. She has more than 55 scientific articles published and 900 citations.

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