# Real-time analysis of thermal conversion products of lignin

Nathan Traullé*[1], Théo Voellinger[1], Jasmine Hertzog[1], Sébastien Schramm[1], Anthony Dufour[2], Vincent Carré[1], and Frédéric Aubriet[1]

[1]Laboratoire de Chimie et Physique - Approche Multi-échelle des Milieux Complexes – Université de Lorraine, Université de Lorraine : EA4632 – France

[2]Laboratoire Réactions et Génie des Procédés – Université de Lorraine, Centre National de la Recherche Scientifique, Centre National de la Recherche Scientifique : UMR7274 / UPR3349, Centre National de la Recherche Scientifique : UMR7274 – France

**Résumé**

Lignocellulosic biomass is a promising renewable alternative to fossil resources in the field of fuels and materials. Lignin represents 15 to 30 wt.% of the lignocellulosic biomass depending on the considered feedstock. Pyrolysis or catalytic fast pyrolysis can be used to efficiently valorise lignin for energy and to produce high added-value chemicals such as BTEXs, which are used as platform molecules. However, the lignin conversion efficiency is strongly dependent on the pyrolysis temperature, catalyst, and biomass. An optimization step is then necessary and requires a fine and rapid description of the obtained products. This can be done using a high-throughput approach employing the hyphenation of a thermal conversion device to a high-resolution mass spectrometer.
A direct injection probe (DIP) was modified to replicate fast pyrolysis. An inert gas flow was added in the DIP capillary to shorten the residence time of the pyrolysis products under a second. Neutral gaseous species were then ionized by an atmospheric pressure chemical ionization (APCI) source, before being analysed by Fourier-transform ion cyclotron resonance mass Spectrometry (FT-ICR MS), as commonly used for bio-oils analysis.(1)

The real-time analysis throughout the entire pyrolysis process by DIP-APCI-MS has allowed to reveal the different stages of lignin pyrolysis. Such analysis is done in a few minutes and allows the determination of the influence of the different parameters on fast pyrolysis of known lignin samples. In addition, a multivariate statistical analysis highlighted the dependence between the lignin feedstock and its pyrolysis products.

The modified DIP-APCI (open-DIP-APCI) is well-suited for the study of lignin pyrolysis and provides a detailed description of the degradation processes involved and the products formed. It should be useful to evaluate the influence of other pyrolysis parameters, such as the catalysts used.
(1) Hertzog et al., **2019**, DOI: 10.1016/B978-0-12-814013-0.00022-3

**Mots-Clés:** Fast pyrolysis, FT ICR MS, DIP, lignin, PCA

*Intervenant