ON-LINE PHOTOIONISATION MASS SPECTROMETRY: AN INTERESTING TECHNIQUE TO STUDY BIOMASS PYROLYSIS

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It is essential to analyse the composition of volatiles in order to understand pyrolysis mechanisms and to design reactors. In this context, the on-line analysis of volatiles appears to be a powerful approach, because it has the ability to analyse the volatiles directly at the gas-phase avoiding their condensation and re-vaporisation of the liquid bio-oils (e.g. for their GC analysis). On-line analysis of volatiles by direct mass spectrometry requires a soft ionisation method in order to reduce the fragmentation of fragile volatiles during their ionisation (fragmentation inside the mass spectrometer). Indeed, the common mass spectrometers using electron impact are not suitable for the on-line analysis of biomass primary volatiles [1]. For this purpose, soft photoionization (PI) mass spectrometry (MS) is a relevant technique to analyse on-line the volatiles. In this talk, we will present the development conducted in our groups on PI−MS analysis of biomass pyrolysis volatiles by (1) synchrotron light PI−MS [2] and (2) custom PI−MS techniques [3–6]. We will give an overview of some studies performed by means of this PI-MS technique, namely:

1) the formation profiles of volatiles as a function of temperature during the slow pyrolysis of different biomasses [3];
2) the effect of biomass composition [6,7] and of fast pyrolysis conditions [7] on primary volatiles produced in a micro-fluidized bed;
3) the kinetic modeling of biomass fast pyrolysis [5];
4) the effect of zeolites structure on aromatics formation during catalytic fast pyrolysis [8].

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