

## Bio oil produced from composted lignocellulosic biomass

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In France, 26% of the emissions of greenhouse effect gas originate from transportation which depends for 87% on fossil fuels. Nevertheless biofuels production can contribute to the fight against climate change while reducing energetic dependence. First-generation biofuels from sugar, starch or vegetal oil are in competition with human food chain, which can lead to food shortages and price rises. At the contrary second-generation biofuel production can use a variety of non food crops while using the lignocellulosic part of biomass <sup>[1]</sup>. Indeed biomass potentially represents in France 30 Mtoe.year<sup>-1</sup> that is to say 15% national consumption. However 80% of these resources are lignocellulosic materials which are hardly exploitable. Gasification, fermentation and direct pyrolysis are the most used processes. However weak yields and high hydrogen need are limiting factors.

The objective of this study was to produce bio oil from lignocellulosic biomass coupling biological and thermochemical pathways. Lignocellulosic biomass was submitted to composting prior to catalytic hydrolifiquefaction. The composting process was conducted over 3 months under controlled conditions. The hydrolifiquefaction reaction was carried out using Raney Nickel as catalyst and tetralin as solvent. During the biodegradation process the organic matter was characterised and its evolution was correlated with physico-chemical parameters. In parallel with the analysis of the organo-soluble fraction, analytical pyrolysis was used to monitor bacterial activity. The alterations of branched to linear fatty acids ratio and of mono- to diacids ratio were compared when determined by thermochemolysis and observed in the directly extractable lipids. Humic-like to fulvic-like acids ratio, infrared spectroscopy and thermodifferential analysis were used to determine the degree of OM complexification.

Longer the destructureation time; higher the yield into oil is thus demonstrating that composting promotes the liquefaction process of green wastes. Among the components of degraded biomass, humin, the major fraction (60–80 wt.%) that was favored by the biological treatment, yields to a bio oil extremely energetic with a higher heating value close to biopetroleum (40 MJ kg<sup>-1</sup>). Contrariwise, Fulvic acids (2–12 wt.%) which became the minor fraction after composting is refractory to liquefaction reaction.



Fig1: 80 L composting reactor



Fig. 2: 4 L Hydrolifiquefaction reactor

1. [1] A. Dermirbas et al., Progress in energy and combustion science, 33 (2007), 1 - 18.