

Fast pyrolysis of *Miscanthus x Giganteus* in an IR heated reactor

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Intensive research on *Miscanthus x Giganteus* (MG), a large perennial grass, has been achieved in the last ten years because of its known advantages for farmers (high yield, low input, perennial crop, easy harvesting...) [refs 1,2,3,4]. MG is often considered as a good candidate to produce renewable energy. As lignocellulosic feedstock, MG could also serve to produce chemicals. This approach is far less present in the literature. Because logistics costs could affect the attractiveness of MG, pyrolysis is an interesting technology for energy densification [ref 4].

Therefore the present work describes the pyrolysis of *Miscanthus x Giganteus*. It is well known that pyrolysis products are solids, liquids and gas. Low residence time, enhanced by high heating rates and high flow rates, favors the production of liquids. A temperature range between 450 and 550°C is also recommended to limit gas formation.

A new pyrolysis apparatus designed to achieve fast pyrolysis via infrared heating and low residence time is described. Process conditions are varied for temperature, particle size, N₂ flow rate and preheating effect.

Pyrolysis temperature should be the most influential parameter upon the yield and properties of bio-oil. Tests are performed at different levels of power and duration. Temperature is measured in the border and in the center of the reactor because of the presence of radial gradients. The highest bio-oil yield and corresponding temperature profiles are presented. The effect of process conditions on bio-oil yield is assessed.

The bio-oil composition is analyzed by GCMS. The results are compared with a direct analysis of MG by Py-GCMS. The bio char is characterized in terms of calorific value with respect to the raw MG High Heating Value (HHV).

Furthermore, on the one hand the outlet gas composition is analyzed by online infrared spectroscopy which gives an indication of potential use as secondary source of energy. On the other hand the porosity of the bio-solid products is estimated by BET low-temperature adsorption method for further valorization purpose of pyrolysis products.

Highlights:

- 1) New experimental results on *Miscanthus x Giganteus* pyrolysis are presented.
- 2) Characterization of every product thus resource potential is evaluated.
- 3) Comparison of Py-GCMS with lab scale pyrolysis of MG is performed.

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