

Biochar production via Low Temperature Conversion (LTC) technology using Thermocatalytic Loop Type Reactor

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Introduction

New markets for the use of animal meal (AM) and meat and bone meal (MBM) in the EU are needed. One way to dispose of AM and MBM based on its high NCV of approx. 18 MJ/kg is combustion. As an alternative thermocatalytic conversion (Low Temperature Conversion; LTC), of AM and MBM at 400 °C in pilot scale is applied. Carbohydrates decay to water and carbon in form of graphite under certain conditions. The catalytic system is formed in situ from the trace element spectrum of the materials converted.

Results and Discussion

A vertically installed thermocatalytic loop type reactor (mobile unit) using a moving and heated char-bed (400°C) consisting of already produced solid residue was designed. AM and MBM are continuously fed into the reactor (1). Since decarboxylation of sodium salts from organic acids is a known chemical method to produce hydrocarbons, low temperature conversion of MBM and AM is performed in the presence of alkaline like ash from the incineration of wood. Products of this process are liquid and gaseous biofuels as well as a solid residue, which contains carbon and non-volatile compounds including metal phosphates. This solid LTC-product has a NCV of 12 MJ/kg and could be incinerated. But it deserves further investigation, since it can be used in a more appropriate and sustainable way. The solid LTC-product or biochar is a long-term carbon sink (carbon dioxide capture and storage; CCS). Moreover it is a natural resource of phosphorous (elemental analysis shows up to 9% P) and can therefore be used as a fertilizer for plant nutrition and soil improvement. There are no traceable proteins in the solid residue; consequently there is an already sterilized product available.

Table 1. Solid product's elemental composition and ash content

Elemental analysis	(%)
Carbon	32
Hydrogen	1.4
Nitrogen	5.6
Sulfur	0.2
Ash	58

The relation of the elements (Table 1) C, O and H are similar to black coal.

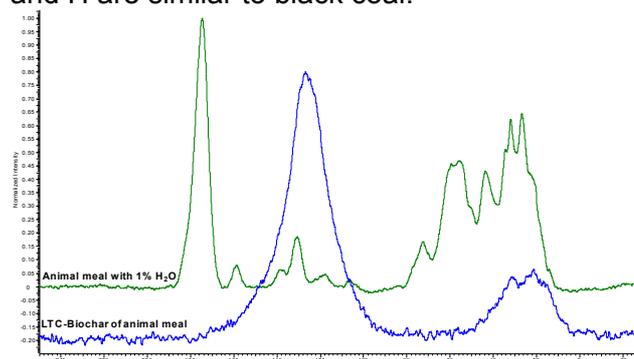


Figure 1. ¹³C solid-state NMR spectra of both AM (above) and solid LTC-product of AM (below).

¹³C solid-state NMR spectra show the elimination of peptide groups prevailing in the substrate. Main components of the product are non volatile ring structures such as sp²-hybridized carbon compounds (Figure 1).

Conclusion

Organic wastes to fuels and renewable raw materials for chemical industry are of ecological and economical interest.

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