
RECENT RESEARCH ACTIVITIES

Selective liquefaction of wood biomass by pulse current heating

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1. Products from fast pyrolysis of wood biomass with pulse current heating

Useful products were obtained from bio-oil and char by fast pyrolysis of wood biomass. Developing technology is relevant for the effective utilization of char and for production of chemicals from bio-oil. On the other hand, shape-controlled porous carbon and catalyst carrier are interesting examples of the potential application of pulse current heating method in order to obtain value added products from residue(char) obtained by fast pyrolysis as Kurosaki reported. [1, 2]

Fast pyrolysis of wood biomass with pulse current heating was examined in order to get useful co-products from bio-oil and to know the optimum pyrolysis conditions of the compositions in bio-oil and structural properties of the co-products. The maximum yield of bio-oil was obtained at around 500°C. GC-MS, FT-IR and elemental analysis made clear the effects of reaction temperature on mass balance, chemical structure of bio-oil compositions, the organics and ammonia adsorbed by char [3].

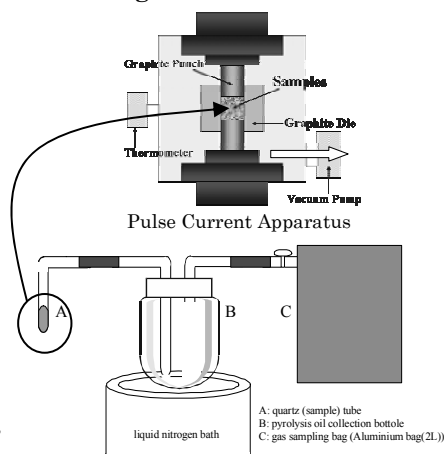


Figure 1. Apparatus and method for collection of pyrolysis products

2. Utilization of Biomass Resources by Selective Liquefaction with Pulse Current Heating Method

Pyrolysis conditions and basic components of woody biomass, plant biomass were studied. The composition of products, bio-oil and the characteristic of char were also studied. The effects of pyrolysis temperature on the compositions of products showed that the maximum yield of bio-oil was obtained at 500°C for rice husks and at 600°C for cellulose. The effects of pyrolysis temperature on the ammonia adsorption capacity of char was acquired. High amount of levoglucosan was contained in bio-oil at 400 - 800°C during pyrolysis of cellulose [4].

3. Investigation of Selective Liquefaction with Pulse Current Heating for Development of Alternatives based on Renewable Resources

The influence of catalyst conditions was studied on the characteristics of char and bio-oil used in the fast pyrolysis with pulse current heating. The micro graphite layer was observed in the char on a condition in the products prepared by using catalysts. The increasing tendency was found on the composition ratio of some aromatic compounds for the bio-oil. Accordingly, catalyst used in the pyrolysis contributes to selective liquefaction and char functionalization [5].

References

- [1] Kurosaki F, Koyanaka H, Hata T, Imamura Y, "Macroporous carbon prepared by flash heating of sawdust", *Carbon* 45, 668-689, 2007
- [2] Kurosaki F, Koyanaka H, Tsujimoto M, Imamura Y, "Shape-controlled multi-porous carbon with hierarchical micro-meso-macro pores synthesized by flash heating of wood biomass", *Carbon* 46, 850-857, 2008
- [3] Honma S, Hata T, Ohashi Y, Watanabe T, "Products from fast pyrolysis of wood biomass by pulse current heating", *Proceedings of 56th Lignin Symposium*, 152-153, 2011
- [4] Honma S, Hata T, Marumoto S, Watanabe T, "Utilization of biomass resources by selective liquefaction with pulse current heating", *197th Symposium on Sustainable Humanosphere*, 145-156, 2012
- [5] Honma S, Hata T, Watanabe T, "Investigation of selective liquefaction with pulse current heating for development of alternatives based on renewable resources", *223rd Symposium on Sustainable Humanosphere*, 169-170, 2013