

Renewable fuels *via* catalytic pyrolysis of biomass

Master Assignment

Bio-fuels can be produced via pyrolysis of wood. Pyrolysis is a thermal conversion process, in which biomass is rapidly heated to 450 - 500 degree Celsius in absence of oxidizing agent. Biomass is converted into liquid oil, combustible gases and charcoal. At present, bio-oil has low quality oil and cannot be used directly as a transportation fuel. Application of catalyst *in* the pyrolysis process may considerably improve the quality of pyrolysis oil.



A schematic of flash Pyrolysis of Wood

Master thesis research is seeking to investigate the effect of catalyst on quality of pyrolysis oil. Experiments will be carried out by varying different parameters e.g. the type of catalyst, the catalyst/biomass ratio, the pyrolysis temperature, residence time and biomass particle size, etc. The yield and composition of produced oil has to be measured. Finally, a mathematical model has to be developed and validated against the experimental findings.

State of the art experimental facilities for thermal conversion of biomass are available at Laboratory of Thermal Engineering (see figures). A down flow reactor has been designed to study the effect of the key process variables on the flash pyrolysis of biomass. In this type of reactor, finely ground wood particles are transported by carrier gas (N_2) through a reactor.

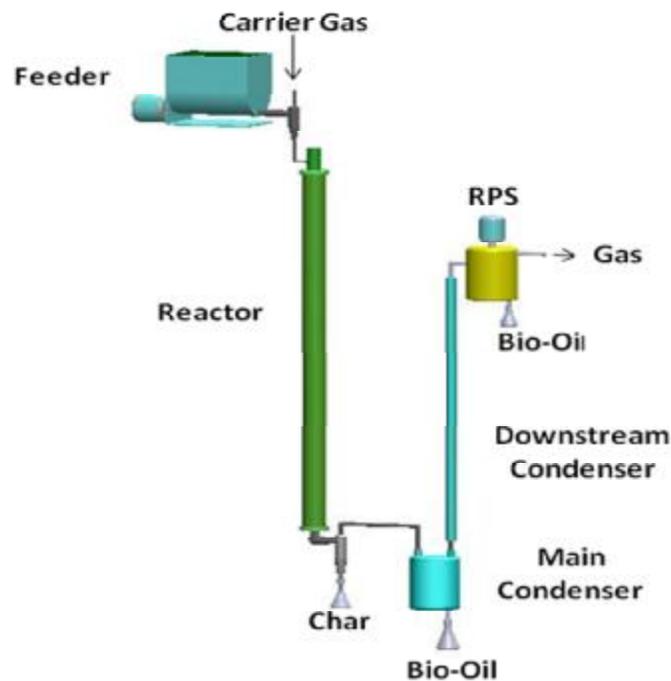


Figure: Setup for biomass pyrolysis

The reactor is a cylindrical quartz tube of 3.3 m length with an internal diameter of 5 cm which is heated up by hot inert gas (N_2). Biomass at a rate of 1 Kg/hr is fed at the top of the reactor. In inert atmosphere at around $550\text{ }^{\circ}\text{C}$, in a few seconds, the thermo-chemical conversion of biomass particles takes place yielding a gas composed of condensables and non-condensables. The condensables are recovered in a condenser as oil.

Contact:

Prof. dr. Ir. Gerrit Brem
 Email: G.Brem@utwente.nl

Ali Imran, M.Sc.
 Tel: 053 489 2417
 Room: N215, De Horst
 Email: A.Aliimran@ctw.utwente.nl