

STUDIES ON THERMAL CRACKING OF PYROGASES FROM BIOMASS

by

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*A thesis submitted
in fulfilment of the requirements for
the award of the degree of
DOCTOR OF PHILOSOPHY*



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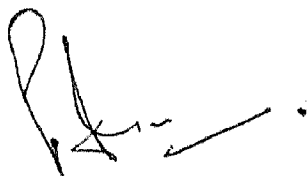
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My Mother

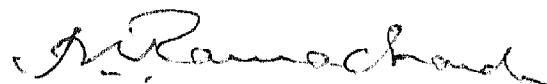
CERTIFICATE

This is to certify that the thesis entitled '**STUDIES ON THERMAL CRACKING OF PYROGASES FROM BIOMASS**' being submitted by Mr. Krishna Raj Shrestha to the Indian Institute of Technology, Delhi, for the award of the degree of **Doctor of Philosophy** is a record of bonafide research work carried out under our guidance and supervision and has fulfilled the requirements for the submission, which, to our knowledge has reached the requisite standard.

The results obtained in this thesis have not been submitted in part or in full to any other University or Institute for the award of any degree.



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ABSTRACT

Among the various non conventional energy sources, biomass has emerged as one of the most potential renewable energy sources. Biomass, specially, rice husk, sugar cane bagasse, cotton and mustard stalks, coffee husk, ground nut shells, coconut coir, etc. are abundantly available. These agro-residues, however, are either grossly under utilised or completely unutilised by burning in-situ in the fields as a means of disposal. One of the promising routes to utilise biomass in an integrated manner is through thermochemical conversion processes such as direct combustion, pyrolysis with or without partial oxidation and gasification which are used for getting energy and value added products.

Pyrolysis is one of the major steps during combustion and gasification of biomass. During these processes, a fraction of biomass is always converted into tars, which are complex mixtures of easily condensable viscous compounds. Cleaning of Pyrogases during carbonisation or gasification can be done effectively by thermal cracking of the tars. By this process tars can be converted into lighter gaseous components to get a clean gas for clean combustion or for its use in I.C engines for power.

In the present work, thermal cracking of tar laden gases obtained by the pyrolysis of rice husk is studied at different cracking temperatures. Effect of temperature of cracking on the yield and quality of gas are studied. Cracking is done in a fixed bed of ceramic beads, dolomite, refractory pieces and charcoal pieces. Results obtained at different cracking temperatures indicate promising tar conversion particularly at higher temperatures. Cracking over charcoal surface at 1000°C resulted in almost complete decomposition of tar and pyroligneous liquor into combustible gases. A detailed comparative study on cracking over refractory and charcoal surface is presented.

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