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# CERTIFICATE

This is to certify that the work presented in this thesis entitled "**Thermal and Catalytic Hydrothermal Upgradation of Jatropha Curcas Cake**" has been carried out under my supervision in Bio-Fuels Division (BFD), Indian Institute of Petroleum (IIP) and is the bonafide work of Mr. Surjya Kamal Chaliha, Department of Energy, Tezpur University, Tezpur, Assam. This work is original and has not been submitted for any other degree or diploma of any other University.

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## Forwarding Certificate

I/We hereby recommend that the thesis prepared under my supervision by Surjya Kamal Chaliha entitled "**Thermal and Catalytic Hydrothermal Upgradation of Jatropha Curcas Cake**" be accepted in partial fulfillment of the requirements for the degree of Master of Technology in Energy Technology.

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# Certificate of approval

The foregoing thesis by **Sri Surjyakamal Chaliha** (Registration Number **ENE08011**) is hereby approved as a creditable study carried out and presented in a manner satisfactory to warrant its acceptance as a pre-requisite to the degree for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve only for the purpose for which it is submitted.

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*On*

***Final Examination for***
***Evaluation of thesis***

10/5/10

# Preface

The increasing cost of fossil fuels and the concerns related to their environmental impact and greenhouse gas effect, as well as the need of securing energy supplies, are accelerating the transition to a bio-based economy. Various R&D tools need to be provided to realize this transition. The reduction/replacement of fossil fuel by biomass has been addressed in recent years worldwide.

The use of renewable resources in manufacturing chemicals and other products is also receiving increasing attention from policy makers. Further transformation of these products leads to polymers, lubricants, solvents, surfactants and specialty chemicals for which fossil fuels have traditionally been used. However, it is necessary to extend the use of biomasses for chemical production and integrate them in the energy business to create a sustainable society. The concept of the biorefinary, initially developed in the food and paper industries, is now being applied to integrate biomass-based energy, materials and chemicals production. A biorefinary maximizes the value derived from the complex biomass feedstock by producing multiple products. Integrated production of bioproducts, especially for bulk chemicals, biofuels, biolubricants and polymers, can improve their competitiveness and eco-efficiency. Also in this case, new R&D tools should be developed to address this change with respect to oil-based energy, material and chemical economy.

This work summarizes biomass processing in hydrothermal media taking the second generation wood based biomass feed, including the thermal and catalytic effect, effect of heating rate in the hydrothermal upgradation/conversion process. The studies done to optimize the process condition to get maximum conversion efficiency, investigation of possibility to convert the hydrothermally produced biocrude to bio-oil and fine chemicals from bio-oils. The study will provide solution to the solid waste management of increasing bio-diesel industry; as a whole study of future fuel and also chemicals in an efficient manner.

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