



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Simulation of Chemical Looping Combustion using Coal and Biomass Mixtures**

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SHORT ABSTRACT

The combustion of fossil fuel produces a massive amount of carbon dioxide (CO₂), leading to increased global warming. Efforts are required to work on technologies that reduce CO₂ emission. Chemical Looping Combustion (CLC) is a viable solution for the efficient fuel combustion with inherent CO₂ separation from other gases in the fuel reactor. The CLC process is based on the strategy of supplying oxygen from combustion air through carrier materials. The carrier material passes through the interconnected fluidized air and fuel reactor and executes the fuel combustion without direct contact between air and fuel by means of recycle type redox reaction. Biomass is an interesting fuel to be tested in both CLC and Chemical Looping with Oxygen Uncoupling (CLOU) owing to its abundant availability. The advantage of using biomass as CLC fuel can lead to the capture of CO₂ through its combustion. This will inherently lead to negative CO₂ emission, as the CO₂ released in combustion is being continuously removed from the atmosphere during biomass growth. Thus use of pure biomass in CLC and CLOU needs to be explored for the reduction of carbon imprint. The current thesis employs ASPEN Plus to simulate and analyse solid fuel conversion process in the interconnected fluidized bed reactor system using biomass and coal mixture as fuel. The aim of the present work is to develop an Aspen Plus model mimicking the experimental study for CLC and CLOU of pure biomass and mixture of coal and biomass using iron-based and copper based oxygen carriers, respectively in fluidized bed combustion.