**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI**
**SHORT ABSTRACT OF THESIS**

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Thesis Title:
Catalytic Hydrodeoxygenation of bio-oil produced from the co-pyrolysis of biomass and plastic waste

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| Thesis Submitted to the Department/ Center | : | Chemical Engineering |
| Date of completion of Thesis Viva-Voce Exam | : | 20.05.2025 |
| Key words for description of Thesis Work | : | Biomass, Plastic, Pyrolysis, Bio-oil, Catalyst, Hydrodeoxygenation |

**SHORT ABSTRACT**

The present study investigates the catalytic hydrodeoxygenation of bio-oil produced from co-pyrolysis of *Mesua ferrea* L (commonly known as Nahar, a non-edible oilseed) and PET plastic. The operating parameters, such as temperature and biomass: plastic feedstock ratio, were optimized, and it was found that maximum bio-yield (35 wt%) was obtained at 873 K, 2:1 (biomass: plastic). The qualitative analysis of the co-pyrolyzed oil revealed that the fatty and carboxylic acids (~55%) dominated the composition. Hence, the bio-oil was upgraded for future applications. In the upgradation process, red mud (RM), an alkaline waste generated during the Bayer process of alumina production, was utilized as a support for mono (Ni) and bi-metallic catalysts (Ni-Co, Ni-Mo) at various concentrations of nickel (5 wt.% each). The catalyst was characterized using FESEM-EDX, FETEM, XRD, ICP-MS, XPS, and Surface area analysis. These catalysts were employed in the hydrodeoxygenation (HDO) of co-pyrolytic oil. The activity of bi-metallic catalysts for HDO reactions increased the PIONA (paraffin, isoparaffins, olefins, naphthenes, aromatics). The highest organic liquid yield (72%) was achieved using the Ni-Co/RM catalyst with low coke formation and high hydrocarbon yield (80%). The resultant upgraded oil exhibited an oxygen content of less than 2wt.%. The properties of the HDO oil were obtained using mono and bi-metallic catalysts at a reaction temperature of 513 K, which ultimately reduced the raw bio-oil's acid content (~55%) and converted to hydrocarbons (80%). The primary reaction mechanism that followed was hydrodeoxygenation (HDO) and decarboxylation (DCO). Overall, applying Ni (10wt%), and Ni-Co supported Red-mud catalysts improved HDO reactions.