

# Catalytic Pyrolysis of Sugarcane Leaves Biomass using Montmorillonite Clay: Reaction Mechanism

Mohit Kumar<sup>2\*</sup>, Siddh Nath Upadhyay<sup>1</sup>, Pradeep Kumar Mishra<sup>1</sup>, Himanshu Sharma<sup>2,3</sup>

<sup>1</sup>Department of Chemical Engineering & Technology, IIT (BHU), Varanasi-221005, India

<sup>2</sup>Department of Sustainable Energy Engineering, IIT Kanpur, Kanpur-208016, India

<sup>3</sup> Department of Chemical Engineering, IIT Kanpur, Kanpur-208016, India

\*Corresponding Author Email: [krmohit@iitk.ac.in](mailto:krmohit@iitk.ac.in) , [mohitiitk1991@gmail.com](mailto:mohitiitk1991@gmail.com) (Dr. Mohit Kumar)

## Abstract

The effect of the Montmorillonite (MMT) clay on the in-situ catalytic pyrolysis of sugarcane leaves biomass has been studied using thermogravimetric analysis (TGA). Pyrolysis of the biomass has been carried out from 35 to 800°C at heating rates of 10, 15, and 20°C/min using biomass powder mixed with 10 and 50% clay. The analysis of TGA-DTG results have demonstrated that the catalyst has substantial effect on the rate of devolatilization of biomass. The amount of clay, however, has only a marginal effect. The kinetic characteristics of non-catalytic and catalytic pyrolysis of biomass have been evaluated employing model-free iso-conversional methods of Flynn-Wall –Ozawa (FWO), Starink, Distributed Activation Energy Model (DAEM), Vyazovkin and Vyazovkin AIC. The presence of the catalyst has reduced the activation energy of pyrolysis from 171.15 to 166.57 kJ/mol. Effect of catalytic material on pyrolysis reaction mechanism have been studied.

**Keywords:** Sustainable Energy sources, clean technologies Sugarcane leaves, Catalytic pyrolysis, Thermogravimetric analysis, Montmorillonite clay