



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : **Monika**
Roll Number : **136107017**
Programme of Study : **Ph.D.**
Thesis Title: **Thermal Degradation Studies of Bionanocomposites**
Name of Thesis Supervisor(s) : **Prof. Vimal Katiyar**
Thesis Submitted to the Department/ Center : **Chemical Engineering**
Date of completion of Thesis Viva-Voce Exam : **August 22, 2019**
Key words for description of Thesis Work : **Thermal Degradation Kinetics, Extrusion, Bionanocomposites**

SHORT ABSTRACT

The aim of the current research is to develop poly (lactic acid) (PLA) based bionanocomposites which is motivated by the problems associated with the conventional polymers. The present research focuses on the development of environmental friendly packaging materials based on biopolymers such as polyesters, i.e. (PLA), polysaccharides (cellulose, chitosan and gum) and their structural complexes modified to a larger extent, to fulfil the requirements of the sustainable future. In order to meet the current demands of the industry and consumer needs, the addition of PLA with nano-functional biofiller is found to be a compelling alternative to the conventional plastic packaging. Nano-functional biofillers are considered to be most suitable alternatives to develop green biocomposites when incorporated into the PLA matrix which offer the advantages of biodegradability, renewability along with balanced properties. The melt processing of PLA with biofiller is a challenging task as the material undergoes thermal decomposition at elevated temperature and the shearing action results in the reduced melt strength. The modification of biofiller is one such strategy which may be adopted to overcome these limitations. Additionally, the chain extenders or radical initiators may lead to the

enhancement in the melt strength during reactive extrusion with a wide range of processing window. Non isothermal TGA kinetics studies at dynamic heating regime along with the evolution of volatile components are observed using the unique thermogravimetry (TGA) and hyphenated TGA Fourier transform infrared spectroscopy (TG–FTIR) techniques. In the current research, a comprehensive kinetic model is employed, including (i) model free methods to investigate the parameters and (ii) generalized master plots to propose the thermal induced mechanism. The influence of biofiller on the degradation mechanism of nanobiocomposite is determined. The current research helps in understanding the fabrication process of PLA based nanobiocomposite films along with its degradation mechanism. The effect of biofillers in tailoring the final properties of the fabricated films has also been presented.

