



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : SAYAN KUMAR BHATTACHARJEE

Roll Number : 156107013

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Name of Thesis Supervisor(s) : Prof. Vimal Katiyar; Dr. Raghvendra Gupta

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**SHORT ABSTRACT**

This doctoral thesis focuses on the valorisation of agricultural waste in the form of rice straw and the fabrication of different polymeric bio-composites and nanocomposites. Other value-added products in the nanometres range were chemically synthesized from RS, i.e., nano-silica (NS), cellulose nanocrystal where these nanofillers are incorporated in various thermoplastic biopolymer matrix, i.e., Poly (lactic acid), Poly (butylene succinate). However, in the melt extrusion process at higher temperatures, miscibility and the phase separation between the polymer matrix and these nanofillers is still challenging for the scientific community as these tend to aggregate due to small size effects, high surface energy, and relatively poor interaction between the filler and the polymer matrix which in turn decreases the mechanical property of the composites. Various compatibilisers and cross-linking agents were incorporated into the systems to improve the miscibility during melt processing. This thesis also investigates the influence of different nanofiller content on the thermal, mechanical, and rheological properties of the bio-composites and nanocomposites. The structure-properties relationship of the composites was explored in terms of the mechanical properties, thermal properties, crystallisation behaviour, and rheological properties, which have been summarized in six different chapters and explained in detail in subsequent sections.