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Entitled

*POLY (LACTIC ACID)/NANOCLAY NANOCOMPOSITES FOR PACKAGING APPLICATIONS*

by

Maissa Akram Adi

Faculty Advisor

Dr. Muhammad Iqbal, Chemical & Petroleum Engineering Department
College of Engineering

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Abstract

With increasing stringent environmental regulations and attempts to reduce dependence on fossils for polymer production, bio-based polymers are receiving appreciable global attention. In this context, bio-based poly (lactic acid) (PLA) is one of the most frequently used polymers in packaging application. However, despite of its high versatility, this polymer is limited in packaging applications due to its low mechanical properties. The two-dimensional nanofillers such as nanoclay and graphene are well known for improving thermo-mechanical properties of polymers at low concentrations. However, increasing higher filler concentration to improve barrier properties of polymers reduces their mechanical properties which is a drawback. This thesis investigates effects of two-dimensional nanoclays on thermal, mechanical, and barrier properties of PLA/clay nanocomposites.

The nanocomposites of PLA with clay and chemically modified clay were synthesized via solution blending method, and their thermal and mechanical properties were investigated. Several characterization techniques were used to understand chemical structure of nanoclays and thermo-physical properties of PLA/clay nanocomposites. The x-ray diffraction indicated increased dispersion and exfoliation of modified clay in PLA compared to unmodified clay. A significant decrease in percent crystallinity of PLA-modified clay nanocomposites was observed. A higher Young's modulus and yield strength and reduced elongation at break revealed increased filler/polymer interactions in PLA/modified clay nanocomposites. Moreover, results from gas permeability also presented.

The results could be used as fundamental understanding of clay/PLA interactions for thin film packaging applications. However, a detailed analysis of extensional rheology is required to assess feasibility of these nanocomposites for film blowing applications.

**Keywords:** PLA, Clay, Nanocomposites, Packaging, Dispersion.