

Public Abstract

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Title:POLYURETHANE FOAMS MADE FROM BIO-BASED POLYOLS

Polyurethane foams have wide applications in the industry. The main raw materials producing polyurethane foams are polyol and isocyanate, both of which are originated from petroleum. Soy-polyols have great advantages in replacing petroleum-based polyol to produce bio-based polyurethane foams. This research was designed to investigate the properties of polyurethane foams made from bio-based polyols. This project includes 4 parts.

In Part I, flexible polyurethane foams were successfully made from a series of soy-polyols with different hydroxyl numbers and functionalities. The effects of cross-linker, tin catalyst, isocyanate index, hydroxyl numbers and functionalities of soy-polyols on physical properties of flexible polyurethane foams were studied.

In Part II, water-blown rigid polyurethane foams were made from 0-50% soy-phosphate polyol (SPP) and 2-4% water content as blowing agent. The water content was firstly optimized in the formulation for polyurethane foams. Based on the results, the effect of isocyanate index on the physical properties of SPP based polyurethane foams was studied.

In Part III, soybean oil-based rigid polyurethane foams were modified by different loadings of glass microspheres and nanoclay. The physical properties, especially the mechanical properties of these polyurethane foams were investigated in this part.

In Part IV, rigid polyurethane foams were made from soy-polyol with viscosity ranging from 12,000 cP to 31,000 cP. This study identified the effects of high viscosity soy-polyols on the physical properties of soy-polyol based polyurethane foams.