CHAPTER 5

CONCLUSIONS AND SUGGESTIONS

Preparation of the HDPE/NR foam, comprises basically of a high-density polyethylene, natural rubber, Epolene wax, a chemical blowing agent, and a cross-linking agent. The HDPE/NR blends were prepared on a two-roll mill. Subsequently, foamed structures of the blends were obtained by a single stage compression molding.

The decomposition temperature of blowing agent must be lower than the degradation temperature of natural rubber. To operate at such a temperature, modification of blowing agent is accomplished by adding an activator (zinc oxide). Instrumental methods were used to monitor the decomposition temperature of the blowing agent including the equipment set for the decomposition temperature measurement (EDTM) and the thermogravimetric analysis(TGA). The suitable zinc oxide loading were used for reducing the decomposition temperature of blowing agent. The amount of zinc oxide used was 10%.

The morphologies of the HDPE/NR blends were determined by SEM. The distribution of the natural rubber in HDPE is uniform.

The dynamic mechanical test reveals that the polymer blends of high-density polyethylene and natural rubber exhibit two Tg's close to the homopolymers of pure high density polyethylene and natural rubber. This indicate that they are the immiscible blend.

Foaming process variables, i.e. heating time, blowing agent loading, ratio of HDPE/NR, cross-linking agent loading, and ratio of HDPE/NR at the fixed cross-linking agent loading affect physical and mechanical properties of HDPE/NR foams especially the cell structure. The heating time has a significant effect on density of the HDPE/NR foams. The suitable heating time in this foaming process is 20

minutes based on the complete decomposition of the blowing agent. The blowing agent loading affects physical and mechanical properties of the HDPE/NR foams, including foam density, hardness, tensile strength, tear strength flexural strength and elastic modulus. The average cell size increases with increasing blowing agent loading. The suitable blowing agent loading depends on the desired density and the application of the HDPE/NR foams. The lower physical properties occur at high ratios of the HDPE/NR blends. The hardness, tensile strength, tear strength, flexural strength and elastic modulus increase with increasing cross-linking agent loading. The average cell size decreases with increasing cross-linking loading. Adding the cross-linking agent can improve hardness and tensile strength but decrease the elongation at break, tear strength, flexural strength and elastic modulus. The ability of the HDPE/NR blends to foam depends on the relative rates between the rate of gas generation of the blowing agent and the crosslink rate of rubber phase. No foam can be obtained if the blow rate of blowing agent is slower than that of the crosslinking rate. The blow rate of the blowing agent, relative to the crosslink rate of rubber, is perhaps the most important factor determining the structures and properties of foam.

HDPE/NR foams exhibit properties between the semirigid and flexible plastic foam depending on foaming process variables.