FOAMABILITY OF NATURAL RUBBER/POLYPROPYLENE BLEND

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ABSTRACT

The effects of natural rubber (NR) compositions on the morphology studies, physical and mechanical properties of foamed polypropylene were studied. Polypropylene/natural rubber (PP/NR) blends compatibilised with N, N-m-phenylenedimaleimide (HVA-2) has been prepared by melt blending in a twin screw extruder followed by hot press, using activated Azodicarbonamide as the chemical blowing agent (CBA). In the addition to the propylene and rubber, the other additives were clay, filler and salicylic acid. The foaming behavior of PP/NR blends were characterised based on morphology studies, density and compression tests. It was found that when the NR composition increased, the densities of materials and cells increased while the average cell size, compressive strength and moduli decreased. These could be due to the increase in the melt strength and polymer elasticity thus resulting in controlled the growth of the nucleus bubbles to form cellular structures. In conclusion, 5% NR composition will produce foamed PP/NR with improved morphological properties such as uniform cells distribution and higher cell density with smaller average cell size. The mechanical properties of the foamed PP/NR were also influenced by the composition of NR in the blend.

CHAPTER 1.0

INTRODUCTION

1.1 Background of the Study

Thermoplastic foams consist of dispersed bubble in a solid polymer. This two-phase structure exhibits unique properties such as buoyancy, high ratio of rigidity/weight and strength/weight ratio (Klempner & Frisch, 1991). Typical thermoplastics foams in industrial applications are made of polystyrene and polyethylene. On the other hand, polypropylene foams which have outstanding functional characteristics such as higher rigidity, higher strength, better impact strength, better heat resistant and better .resistance to more chemicals than other thermoplastics at the same cost level are being considered as a subtitute (Naguib et al., 2001, Frados, 1976). However, owing to polypropylene's weak melt strength and melt extensibility (Park & Cheung, 1997) processing window for foaming polypropylene is extremely narrow. Limited at lower end by its melting temperature and poor melt strength at the upper end, the processing temperature range spans about four degrees centrigrade (Bradley & Philips, 1990).

The introduction of branched polypropylene resins has resurrected interest in polypropylene foams (Spietel et al., 2002). Some studies have shown the ability of these branched resins, either pure or blended with linear polypropylene, to enhance melt strength thus widened the processing window (Naguib et al., 2001, Bradley & Philips, 1990). Because of the high price of branched polypropylene, it has been of great interest to the foam industry to use a blend of linear and branched resins (Naguib et al., 2001).