CHAPTER I
INTRODUCTION

Polyolefins are the principal commodity thermoplastics. Major types of polyolefins are polyethylene (PE) and polypropylene (PP). PE is widely use in automobiles, household appliances, construction, and electrical industries because of its has excellent low temperature flexibility, low cost and a wide range of physical and chemical properties. A large portion of PP is used as extrusion products, especially as flat film products because of its good properties such as excellent chemical resistance, high surface quality, high application temperature and relatively low price result in continuous growth of its production and expansion of its market.

However, their uses in polymer blends have been limited, because of their lack of reactive functional group for interfacial adhesion and bonding. The weak interaction between the two components , these blends were phase separated results in poor interfacial adhesion and mechanical coupling between phases. In addition, the morphology is usually unstable, which causes bad mechanical properties. The addition of block or graft copolymers as compatibilizers in polymer blend, as adhesion promoters and as bonding agents for polymer blend can produce a finer morphology and increase the interfacial adhesion. Their compatibilization efficiency will also depend on their grafting degree, melt flow index and rheological properties.

Grafting of preformed polymer is an important method for preparation of polymers with suitable functional groups. Grafting involves covalent coupling of species, usually monomers or chain extenders, onto an existing polymer backbone. Maleic anhydride (MAH) has been widely use as a grafting monomer to functionalize polyolefins because of the higher reactivity of the anhydride group. There are several techniques to modify polyolefins, including solution grafting, photografting, solid-phase grafting, ultrasonic-initiated grafting and free-radical melt grafting can be used. The free-radical melt grafting is usually preferred as the most reliable and successful method. The grafting modification of PE and PP by maleic anhydride (MAH) through free-radical grafting in the presence of organic peroxide has received much attention during the past two decades. Polyethylene grafted with maleic anhydride (PE-g MAH) and polypropylene grafted with maleic anhydride

(PP-g-MAH) are usually accompanied by side reactions, including chain scission for polypropylene (PP) and chain branching/crosslinking for polyethylene (PE). Many attempts have been made to study the parameters effecting the MAH grafting reaction and also studied the properties of in situ compatibilized blends. Razavi Aghjeh et al. studied parameters affecting the free-radical melt grafting of MAH onto low-density polyethylene (LLDPE) with dicumyl peroxide (DCP) in an internal mixer. The order of feeding, rotor speed, temperature, initiator and MAH concentration had effect on the grafting degree. Yilser Guldogan et al. studied grafting of PP in two forms (power and granular) with MAH in twin-screw extruder with DCP as a radical initiator. Mousa Ghaemy et al. studied grafting of MAH onto PE for various initiator; benzoyl peroxide (BPO), azobisisobutyronitrile (AIBN) and dicumyl peroxide (DCP). Zen chen studied effect the graft yield of MAH on the rheological behaviors. Chaoqin Li et al. studied effect of MAH grafted low-density polyetylene (LDPE) blend with PP in difference ratio on the viscosity. It is essential to know the viscosity behavior of polymer, not only for reaching processing conditions, but also for collection valuable information on the flow mechanism and its effect on both morphology and ultimate mechanical properties. In physically compatibilized blends, the rheological properties are influenced by the amount, molecular weight, and architecture of the added copolymers. The literature on the rheology relation in chemically compatibilized is, rather limited. However, few reports are observed on the relationship of grafting efficiency and rheological properties in melt flow index (MFI) of HDPE and PP.

The purpose of this work is to study grafting of maleic anhydride onto polyolefins by melt grafting method. The effects of influential parameters on the free-radical melt grafting of MAH onto high-density polyethylene (HDPE) and polypropylene (PP) with dicumyl peroxide (DCP) as a free-radical generator in a twin screw extruders, the difference of MFI of HDPE and PP, MAH content, initiator concentration, degree of grafting , melt flow index (MFI) and properties of maleated polyolefins such as thermal properties and rheological properties were among the parameters investigated.

OBJECTIVES

1. To study the grafting of maleic anhydride onto polypropylene and polyethylene by melt systematic grafting method.
2. To study the effect of DCP and MAH on the grafted HDPE and PP.

SCOPE OF RESEARCH

The scope of this research will cover the following:

1. Preparations of graft maleic anhydride onto polyolefins (HDPE and iPP) by using melt grafting method in co-rotating twin screw extruder. Dicumyl peroxide (DCP) was use as initiator and varies molecular weight of HDPE and PP, MAH content and initiator concentration and
2. Measurement of degree of grafting by back-titration technique and MFI of each sample.
3. Measurement of the properties of polyolefins grafted with maleic anhydride using rheology and thermal properties were carried out.