CHAPTER I
INTRODUCTION

Last decades, silk has been gained considerable attention not only in textile industry but also in medical plastic purpose. In the recent years, many researchers have aimed the interest to new applications of silk as an environmental friendly bioplastic and bioplastic suited to living bodies. Silk shows crystalline properties with high tensile strength and can undergo quite large deformations in compression. Moreover, the amino acid compositions in silk are mainly based on glycine and alanine, hydrophobic amino acids with small side chains which are hard to make chemical reaction. This is considered as the outstanding characteristic of silk to be used as an effective bioplastic structural material.

Blends of silk fiber (SF) with engineering plastic polymer have attracted considerable academic and practical interests. However, the blends still suffer from some inferior performances and the immiscibility of silk fiber with other synthetic polymer. Polyethylene (PE) is a commercial polymer used in a very big scale in various applications including medical purpose e.g. the artificial bone. There have been a number of the literatures on the blends of PE and other natural fibers, but to our knowledge, there are a few works on blending system of PE with silk fiber. Moreover, these blend properties are often poor because of the immiscibility between two components.

Adding functionalized polymer components to modify interfacial interactions between two phases should be studied. Graft-copolymerization of methyl methacrylate (MMA) monomer onto PE matrix has established the chemical functionality through carbonyl group which can interact with silk's carbonyl or amide group.

In this case, the blending process is separated into 2 steps. First, PE is functionalized by MMA using free radical initiator, dicumyl peroxide (DCP), to initiate the grafting reaction between MMA and PE backbone. Second, the functionalized PE is blended with silk fiber. The functionalization and blending steps are proceeded in the same mixing equipment. This process is called one-step reactive blending.

The mechanical properties of the final blends between MMA grafted PE and silk prepared by one-step reactive blending are studied. The specific intermolecular interactions through hydrogen bonds between silk and MMA grafted PE, the morphology, and the thermal properties of the final blends are considered as the important factors in order to explain the final blend's mechanical properties.