CHAPTER I
INTRODUCTION

Nowadays, polypropylene is widely used in fiber industry because of its advantages such as low density, good chemical resistance, easy processibility, good surface resistance, strain resistance and especially it has low cost which is the advantage over nylon and polyester fibers. However, polypropylene presents some drawback due to the structure of polypropylene which is non polar aliphatic structure and has high crystallinity. So it does not have active site to attach with functional group of dyes and results in poor dyeability. Articles made from polypropylene are usually colored by pigments. However, the use of pigments is not trivial and often has a deleterious effect on other properties of fibers. In addition, the pigment must be added to the polymer while polymer is molten and the process for producing fiber need to be done again if changing of the color is required. So this is very inconvenient for the fiber industry. Due to this problem, the improvement of dyeable polypropylene is needed to achieve fiber that can be easily dyed by the conventional process in fiber industry.

The poor dyeability problem of polypropylene can be solved by addition of the active groups that form interactions with dye molecules. There are various methods to produce polypropylene with active sites for improving dyeability such as copolymerization with other monomers, blending or grafting with other polymers or metal complex or use of additives. However, all of these technologies results in the higher cost of products and the manufacturing cost is no longer an outstanding property of polypropylene over nylon and polyester.

Another and a more recent method for producing dyeable polypropylene is the addition of nanoparticles into polymer to act as dye sorption. The improvement of dyeability by chemical reaction requires chemical reactivity in polymer structure but it does not necessary for the use of nanoparticles. And due to its small size that gives large surface area that is necessary for a good sorbent, so nanoparticles can be used to improve dyeability in polypropylene and also improve other properties of textiles. Nanoclay is interested over other particles because of its common availability with good quality and low price.

In the present study, the dyeability of polypropylene fiber was improved by the use of organo-modified clay. The nanoclay/polypropylene fiber was prepared and its dyeability was investigated. Dyeability of the fiber with various types of dye i.e. acid dye, basic dye, disperse dye and direct dye, and organoclay with different types of modifying agents were studied. Also, the amount of clay and draw ratio for producing polypropylene nanoclay fiber were optimized.

OBJECTIVES

1. To improve dyeability of polypropylene fiber using organo-modified clay.
2. To investigate effect of organo-modified clay on properties of polypropylene fiber.
3. To determine effect of clays, classes of dyes and surfactants on the dyeability of organoclay/polypropylene fiber.

SCOPE OF RESEARCH WORK

The scope of this research work will cover:

1. Preparation of organoclay by using ion exchange reaction.
2. Preparation of organoclay/polypropylene fiber by melt spinning method.
3. Determination of effect of the following parameters on the dyeability, mechanical and other properties of organoclay/polypropylene fiber
    1) Effect of Compatibilizers
        - Sodium-neutralized ethylene-co-methacrylic acid (Surlyn®)
        - Polypropylene-grafted-maleic anhydride (PP-g-MAH)
    2) Effect of types and amount of clay
        - 3, 5, and 7 phr organoclay/PP
    3) Effect of type of surfactant and dye
        - Surfactant
            - Methyl di-[(partially hydrogenated) tallow carboxtmethyl]-2-hydroxyethyl ammonium methylsulfate, (DOEM)
            - Alkyl dimethyl ammonium chloride (BTC 8358®)
        - Dye
            - Acid dye : Lanaset Red 2B
            - Basic dye : Maxilon Red GRL 200%
            - Disperse dye : Erionyl Red A-2BF
            - Direct dye : Terasil Red SD
    2) Effect of draw ratio
        - 15.3 x 1000
        - 26.5 x 1000
        - 35.6 x 1000
        - 47.6 x 1000