Synthesis and Application of alkyl-substituted Super hydrophobic dyes for unmodified Polyolefin fibers

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1. INTRODUCTION

Polyolefin fibers have good processibility and are resistant to chemicals. In addition, manufacturing costs of these fibers are relatively cheap. Polypropylene and ultra high molecular weight polyethylene(UHMWPE) fibers are representative of polyolefin fibers. These fibers are lightweight fibers. UHMWPE fiber is also high-strength fiber. But dyeing of both fibers is difficult because of the extreme hydrophobicity of these fibers.

This study shows that dyeing of polypropylene and UHMWPE fibers without any physical and chemical modifications is possible at the established process by alkyl-substituted super hydrophobic dyes.

2. EXPERIMENTAL

Dyes used this study were alkyl-substituted super hydrophobic dyes of the three primary colors. Pure polypropylene and UHMWPE fabrics were added to dye dispersion solution at the liquor ratio of 1:50 and dyed at 130℃ for 1 hour. After dyeing, the fibers were rinsed in cold water and reduction cleared at 70℃ for 15min using a 20:1 liquor ratio and then-rinsed in cold water. The dyed materials were tested for wash, light, rubbing and sublimation fastnesses.

3. RESULTS AND DISCUSSION

Both polypropylene fiber and UHMWPE fiber are dyed with super hydrophobic dyes having different alkyl derivatives on the same chromophore. The affinity of the dyes onto polypropylene was increased with increase of length of alkyl substituents. The overall color strength was also improved significantly for the longer alkyl substituted dyes. In the case of blue dyes, the dye having pentyl derivatives on the anthraquinone chromophore shows the highest K/S value. Yellow and red dyes having hexyl derivatives on the azo chromophore show the highest K/S value. But UHMWPE fiber shows different behavior. Color strength of this fiber is a little lower than polypropylene fiber. And the affinity of the dyes onto UHMWPE fiber was increased with increase of length of alkyl substituents up to propyl substituents, but decreased with more increase of length of alkyl substituents.

As for the fastness properties, wash fastness of dyed polypropylene fiber was relatively good, while light fastness was relatively low. Fastness properties were also improved for the longer alkyl substituted dyes. Light fastness of red dye shows relatively moderate grade than other colors.

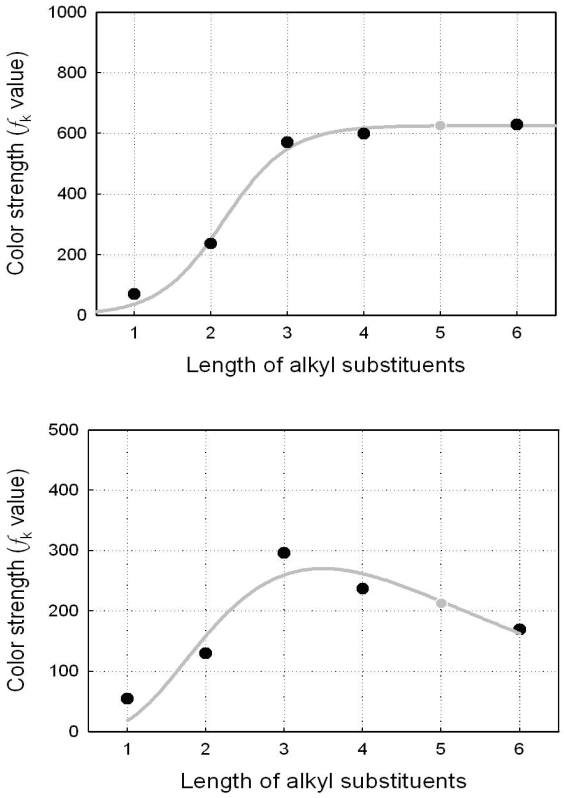

Fig. 1. Color strength of the polypropylene fiber(a) and UHMWPE fiber(b) dyed with red dyes according to length of alkyl substituents.