

# Study of Reactive Dyeing and Flame Retardancy of Cotton Fabrics Treated with Phosphorus Organic Compounds

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## 1. Introduction

Cotton, the most commonly used as a textile material, is also a highly combustible fiber. Flame retardant finishing of cotton fabrics and garments becomes necessary to improve human safety under many circumstances. The use of organophosphorus chemicals to reduce the flammability of cotton has been the focus of textile flame retardant finishing since 1960s. In this research, we used 3-(hydroxyphenyl phosphinyl) propanoic acid under the commercial name of "HIRETAR-205" and oxaphospholane glycol ester under the commercial name of "Exolit PE 100" to treat the cotton fabric, although they are very effective flame retardants for polyester. In addition, the treated fabrics were dyed with C. I. Reactive Blue 4 (Anthraquinone Dichlorotriazinyl) and C. I. Reactive Blue 19 (Anthraquinone Vinylsulphonyl) to investigate the effect of dye structure on the flame retardant of cotton.

## 2. Experimental

Cotton fabrics were treated with different flame retardants dissolved in water or ethanol, with/ without sodium hypophosphite ( $\text{NaH}_2\text{PO}_2$ ) as a catalyst. The soaked cotton fabrics were dried at 85°C for 5 min, followed by curing at various temperature for 3 min. The cured fabrics were soaked in ethanol/distilled water (50/50, v/v) solution for 10min to remove unreacted chemicals, followed by rinsing with distilled water.

The treated fabrics were dyed with C. I. Reactive Blue 4 and C. I. Reactive Blue 19 using IR dyeing machine. Color strength was measured using an X-Rite Match-Rite spectrophotometer. Flame retardancy was assessed in accordance with KS K 0585 method.

### 3. Conclusions

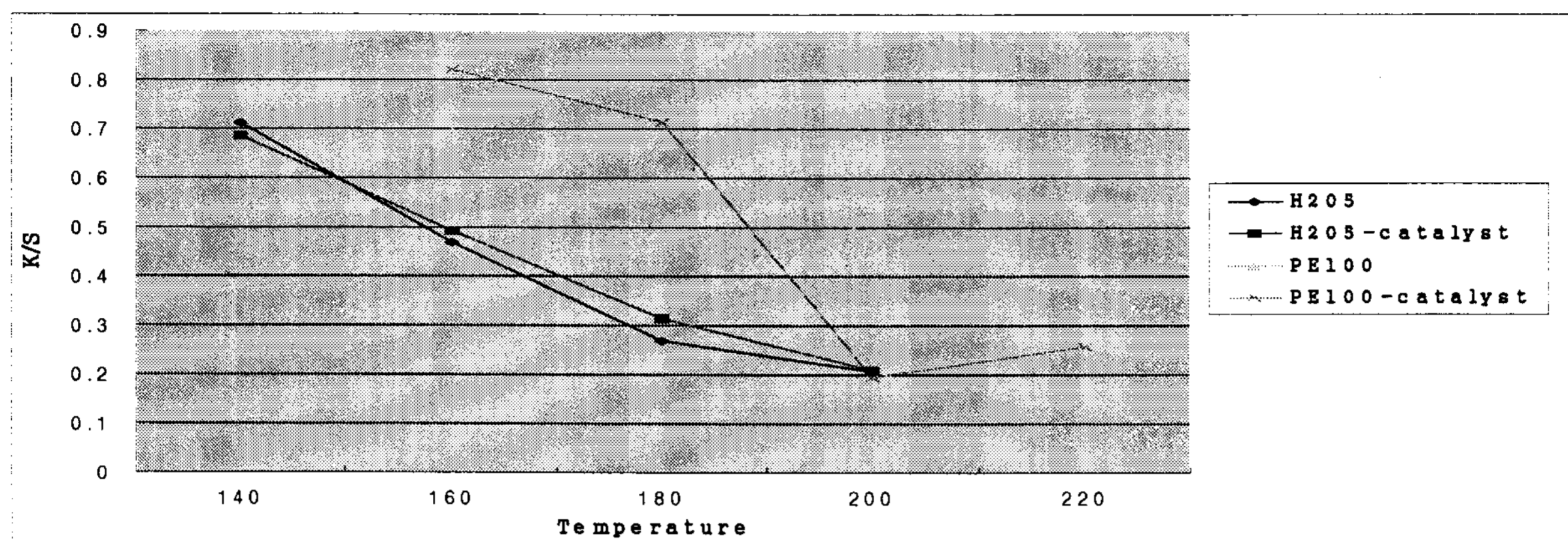


Fig.1. K/S values of flame retardant treated fabrics dyed with blue 4 according to curing temperature.

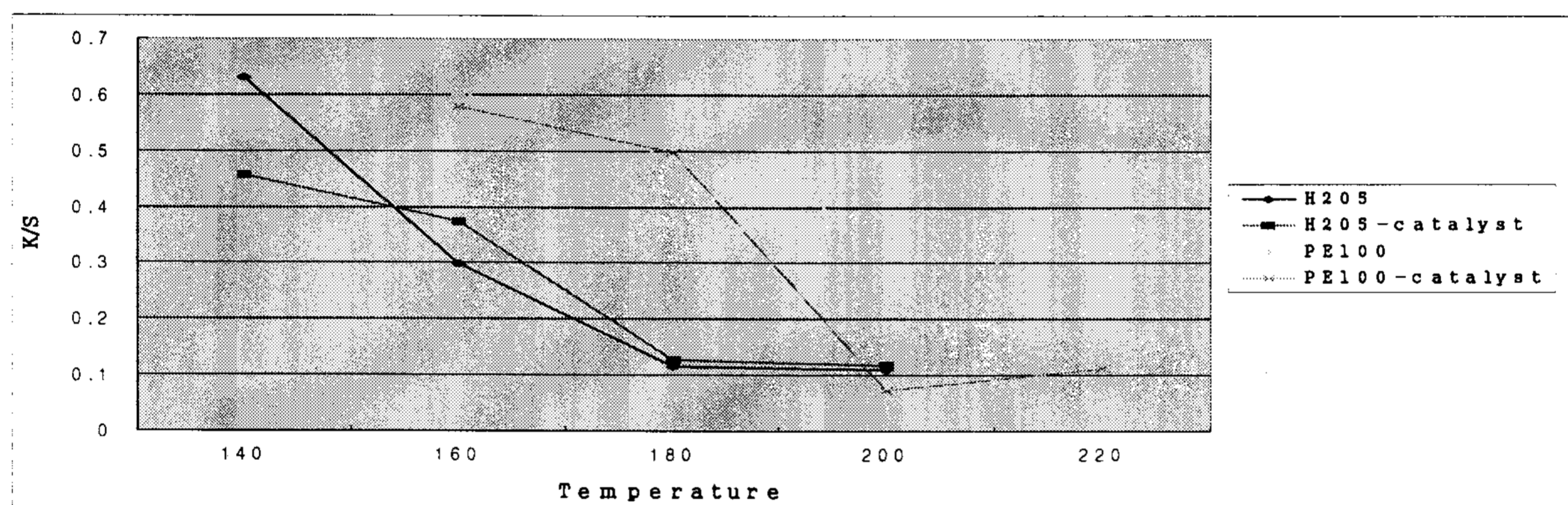


Fig. 2. K/S values of flame retardant treated fabrics dyed with blue 19 according to curing temperature

In the figure 1 and 2, the K/S values of treated fabrics were decreased with increasing curing temperature in both of the reactive dyes. The causes of low K/S values of high temperature cured fabrics were due to the high reactivity between flame retardant and cotton fabrics at elevated temperature. When the treated fabrics were dyed with reactive dyes, there were few dyeing sites.

### Reference

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