

## Direct Coloration using Self-assembly Fabrication Method on PET Fibers -Surface diazo coupling reaction-

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**Abstract**— The electrostatic layer-by-layer technique provides a convenient way to control the construction of ultrathin films at nano-scale ranges and can be easily obtained. It can be also applicable to fiber substrate with dye compounds. We have fabricated multilayer dye films using diazonium resin and three couplers, which are prepared by self-assembly approach. This method is based on layer-by-layer deposition using electrostatic attraction between oppositely charged ions. Beside, the diazo coupling reaction proceeded to form azo dye layer on the PET fibers the same time. The corresponding results of the multilayer films have been discussed on the level of color strength (K/S).

**Keywords:** layer-by-layer, coupling reaction, diazonium resin, coupling compound

### 1. Introduction

Preparations and characteristics of ultra-thin layers are of considerable interests due to their potential technological applications in the fields of coatings, sensors and optoelectronics. These films are commonly formed using Langmuir-Blodgett (LB) deposition or self-assembly techniques based on chemisorptions<sup>1)</sup>. Self-assembly electrostatic layer-by-layer film deposition has been presented to be a simple method for fabricating thin films.

The electrostatic attraction between oppositely charged molecules seems to be a good driving force for multi-layer build-up property.

The general thickness of the fabrication films can be simply controlled and monitored using the deposition numbers<sup>2,3)</sup>. This technique has been actively investigated in recent years from Tani and Nakamura<sup>4)</sup>. However, there have been few studies on applying it to textile dyeing and finishing process. In this context, the preliminary approaches, namely alternate layer-by-layer self-assembly

attraction with dye moieties onto fiber substrates might be a useful skill to produce coloration and functional effect.

Azo dyes, the largest chemical class of dyes with a variety of color ranges, have been used in textile dyeing<sup>5)</sup>. Almost without exception, azo colorants are prepared by diazotization of a primary aromatic amine followed by coupling reaction of the resultant diazonium salt with an electron-rich nucleophile. This coupling reaction is commonly known as phenol and amine coupling, respectively. Hydroxyl compounds such as phenols and naphthols are coupled in an alkaline condition, whereas amine compounds are coupled in a slightly acidic medium<sup>6)</sup>.

In this study, the diazonium resin<sup>2,7)</sup> and three couplers were prepared to manufacture multi-layer dye films on the PET fibers. Beside, the diazo coupling reaction proceeded to form multi dye layers on the PET fibers at the same time. Dyed fibers have been measured the level of color strength (K/S) and the characteristics were discussed in detail.

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commercial interests. This consideration will be further examined.

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