

Adsorption properties of Iron phthalocyanine derivatives on PET fabric and deodorizing effect

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1. INTRODUCTION

Carboxylated phthalocyanines have a good property as an organic deodorant material by an oxidative odor-removing system [1]. However due to their extremely low substantivity to the hydrophobic synthetic fibers, metal phthalocyanine derivatives are limited to be applied to cellulosic polymers, such as cotton and rayon, using exhaust method [2-3]. In the literatures, a swelling agent can improve the substantivity of dyes onto fibers [4]. To increase the affinity to PET fiber, in this study, four kinds of metal phthalocyanine derivatives were synthesized, such as tetracarboxylic iron phthalocyanine, octacarboxylic iron phthalocyanine, dinitro dicarboxylic iron phthalocyanine and diamino dicarboxylic iron phthalocyanine. These four derivatives were adsorbed on PET fiber.

2. EXPERIMENT

2.1 Materials

Synthesized four kinds of MPc derivatives were listed on Table 1. 100% regular PET fiber was used for adsorption.

2.2 Milling for exhaustion

Four synthesized MPc derivatives were prepared for application to cotton fiber by means of a WSD-13 sand mill (Woo seong co., Korea). MPc derivatives as well as the dispersing agents UL-NA (Borregaard, Norway) and Reax-85A (Westvaco, USA) were stirred in water at room temperature for 1hr and then circulated in the mill at room temperature for 3hr. After milling of MPc, particle size was analyzed, below 300nm.

2.3 Adsorption of MPc on PET fiber

Two different methods were employed for fixing phthalocyanine on the fiber, an exhaust method using binder and a padding & curing method after pre-treatment with 1-phenoxypropan-2-ol as a swelling agent without binder. The exhaust method was carried out at 4% o.w.f. of phthalocyanine, 20g/l of binder, pH 4 and temperature of 130°C for 60min. Padding & curing method was conducted by

two separated steps. The first step was pre-treated PET fabric with 4g/l of 1-phenoxypropan-2-ol at 130°C for 60min, thereafter the second step, padding & curing, was performed through a stenter at 200°C for 3min.

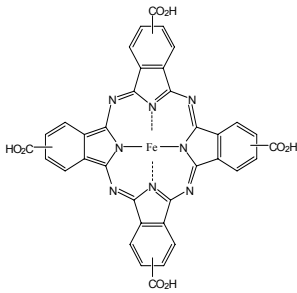
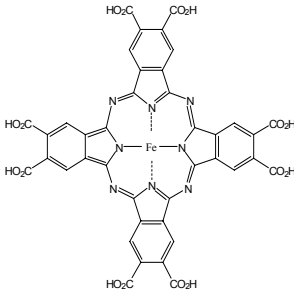
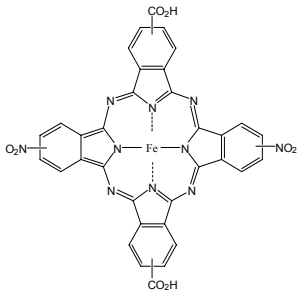
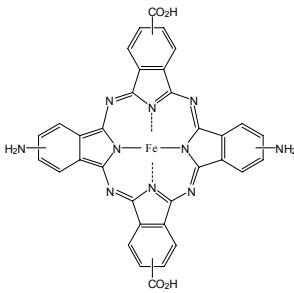
2.4 Measurement of adsorption properties

K/S values of each fiber were measured by a CCM(X-rate 800, USA).

2.5 Deodorizing test

Deodorizing rates were tested by a detector tube method for ammonia gas.

Table 1. Chemical structure of synthesized MPc

Tetracarboxylic Iron phthalocyanine	Octacarboxylic Iron phthalocyanine
	
Dinitro dicarboxylic Iron phthalocyanine	Diamino dicarboxylic Iron phthalocyanine
	

3. RESULT & DISCUSSION

3.1 Adsorption properties of MPc on PET fiber

K/S values of treated fabrics by padding & curing method were arranged from 1.63 to 2.41,

where octacarboxylic Iron phthalocyanine gave the highest value (2.41). Comparatively lower values of less than 1.0 were observed with all fabrics treated by an exhaust method (Figure 1). Judging from these results, padding & curing method with a pre-treatment improved effectively the affinity of phthalocyanines to PET fiber.

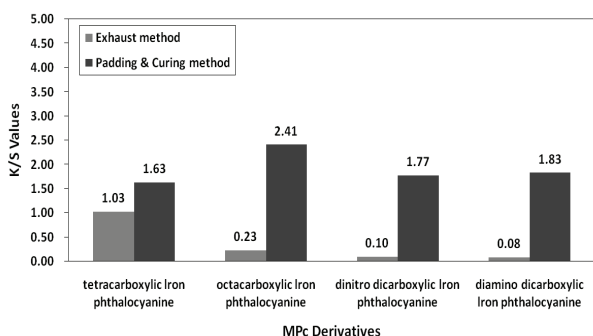


Fig. 1. K/S values of MPC derivatives on PET.

3.2 Deodorizing effect

Deodorizing rates of padding & curing treated fabrics with octacarboxylic Iron phthalocyanine provided the highest result of 88%, 90%, 90%, 90% by passing time of 30 min, 60 min, 90 min, 120 min, respectively. It was also found that less numbers of carboxylic acid groups, such as di- and tetra-, tended to decrease the deodorizing efficiency in comparison with that of octacarboxylic analogue.

4. CONCLUSION

Four kinds of MPC derivatives synthesized were adsorbed on PET fiber by two different ways, such as exhaust method and padding & curing method. By comparing the K/S values, padding & curing method with a pre-treatment was more effective to treat PET fiber with MPC, especially octacarboxylic Iron phthalocyanine. On the effect of deodorizing, octacarboxylic Iron phthalocyanine provided the highest result of 90%. The observed deodorizing rate indicated that carboxylic phthalocyanines could be promising materials for the synthetic PET fibers as healthcare garments.

5. REFERENCES

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