

High Fastness Dyeing of PET Artificial Suede

Eun Chul Kim, Byeong Jun An, Won Jin Seo¹, Jae Yun Shim², Jae Hoon Ko²

R&D team, Sam Kwang Co.,Ltd, #3194-3, Bisan-7dong, Seo-Gu, Daegu, South Korea

¹ Materials Technology & Analysis Team, Hyundai Motor Company

² Textile Fusion Technology R&D Department, Korea Institute of Industrial Technology

E-mail: chulbear@nate.com

1. INTRODUCTION

Artificial suede is made of micro-fiber which makes its dyeing very difficult. The reason is that as the diameter of fiber becomes finer, surface area per unit weight increases, leading to enlargement of dye adsorption space, which consequently causes the phenomenon of light color shade(K/S value) when dyeing process is carried out with same quantity of dyestuff. Also, as the consumption of dyestuff increases, which causes the problem of deteriorated dye adsorption and declined fastness(washing, light and rubbing).

Moreover, the non-woven fabric impregnated with the polyurethane resin to endow rebound resilience and sense of touch[1] have extra problem of dye adsorption and bad color fastness due to non-adsorbed dyes and migration of dyes[2] by polyurethane resin with dyeing process.

Traditionally artificial suede has been fabricated using a solvent soluble polyurethane, environmental pollution results from using this. Recently, environmental problem have emerged globally, and regulations have been enforced against use of organic solvents such as DMF and DMAc which were used for solvent soluble polyurethane as it cause environmental contamination and inflict critical hazard to human body.

In this study, non-woven fabric made of PET micro-fiber(sea-island type) was impregnated with waterborne polyurethane resin, the artificial suede is harmless to human health and excellent color fastness was devised through development of dyeing process and after-treatment process.

2. EXPERIMENTAL

2. 1. Materials

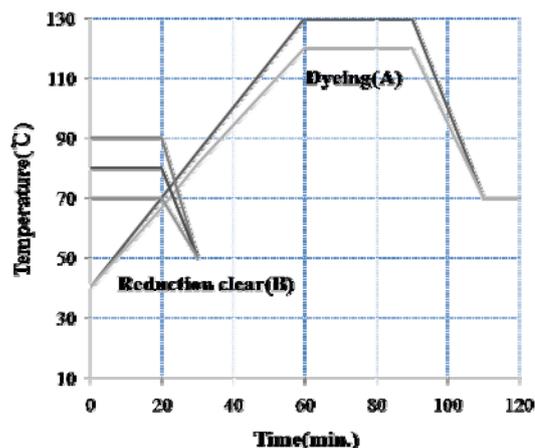
Artificial suede was prepared with PET micro-fiber(HUVIS) and waterborne polyurethane by impregnation-elution-heat set-sanding process.

Commercial samples were provided by DyStar and

Clariant. The dyes were used without purification and the kinds of dyestuffs were next; DIANIX YELLOW AC-E, DIANIX RED AC-E, DIANIX BLUE AC-E, DIANIX YELLOW AM-2R, DIANIX RED AM-SLR, DIANIX BLUE AM-2G, DIANIX BLACK AM-R, DIANIX BLACK AM-SLR, FORON YELLOW AS-3L, FORON RED AS-3L, FORON BLUE AS-3L.

2. 2. Dyeing and reduction clearing process

Artificial suede was dyed in laboratory equipment STARLET 2(Daelim Starlet, IR Dyeing Machine) at 120 and 130 °C in scheme 1(A). The dyeing bath contained 1g/l Syanthpal-DRE as a dispersant, 0.3g/l acetic acid, and dyes. Reduction clear was conducted with sodium Hydro 1g/l, sodium hydroxide 1g/l at 70 ° C, 80 ° C, and 90 ° C in scheme 1(B).



Scheme 1. Dyeing and reduction clearing process.

3. RESULTS AND DISCUSSION

The result of this study showed that in selecting dyes, Dyestuff of E Type (mainly is used light color) was good in color stability for the color matching of reproduction but quite inferior in washing fastness. To improve the washing fastness, dyed non-woven

fabrics were treated with alkali and reducing agent after dyeing which resulted in improved color fastness but color change was more bad after reduction clearing(in table 1), so this type was not selected.

Table 1. Washing fastness of artificial suede with E-type dyes.

	After dyeing	After reduction clearing
Color change	4	3
Acetate	4	4-5
Cotton	4-5	5
Nylon	3-4	4
PET	4	4-5
Acrylic	5	5
Wool	5	5

* DIANIX YELLOW AC-E 0.5% o.w.f., DIANIX RED AC-E 1.2% o.w.f., DIANIX BLUE AC-E 1.1% o.w.f.
Dyeing condition 130 ° C, Reduction clearing condition 80 ° C
Evaluated by ISO 105-C01

Another group of dyes which is strong type in light showed excellent light fastness but obtained unsatisfactory results in washing fastness in table 2. Reduction clearing was done to the group like E-Type, which resulted in improved washing fastness. So this group of dyes were selected, reduction clearing process was proper for the deep color shade. Particularly in Black color, superior build-up and dyeing fastness could be achieved.

Table 2. Washing and light fastness of artificial suede with S- and SS- type dyes.

	After dyeing	After reduction clearing
Color change	3	4-5
Acetate	3	3-4
Cotton	4	4-5
Nylon	1-2	3
PET	2	3
Acrylic	2-3	3
Wool	4	4-5

* DIANIX BLACK AM-SLR 16% o.w.f., DIANIX BLUE AM-2G 0.5% o.w.f.
Dyeing condition 130 ° C, Reduction clearing condition 80 ° C
Evaluated by ISO 105-C01 and ISO 105-B02

4. CONCLUSIONS

Artificial suede was prepared with PET micro-fiber and waterborne polyurethane had problem of unsatisfactory fastness due to the highly surface area, non-adsorbed dyes, and migration of dyes. Therefore, dyes should be chosen by some standard and the condition of reduction clearing process should be decided by a datum line.

ACKNOWLEDGEMENT: This study was supported by grants from MKE(Grant no. B0008096).

5. REFERENCE

- [1] K. S. Kim, M. S. Lee, and H. J. Shim; *Textile Science and Engineering*, 42, 48-49(2005).
- [2] Hong-Fei Qian and Xin-Yuan Song; *Dyes and Pigments*, 74, 672-676(2007).