UV PROTECTION OF TEXTILES IN WASHING PROCESS

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Introduction

The comfortable ultraviolet (UV) protective cloth can protect wearer from the harmful effects of UV radiation.

UV protective properties can be provided by adequate composition, construction, selection of coloration and UV compounds added during production, finishing and textile care processes.

The aim of the scientists is to research the most promising option in the protection of textiles. It was found that fluorescent whitening agents in detergents increase UV blocking ability of cotton fabrics.

The research was focused on the washing of white cotton and polyester/cotton lightweight fabrics with detergent containing fluorescent compounds, fluorescent whitening agent and UV absorber.

The impact of fluorescent compounds was characterized by fluorescence and spectral characteristics, expressed through whiteness and percent of transmission.

Experimental

Three different white fabrics designed for summer cloth were applied for the study.

Table 1: *Technical characteristics of tested fabrics*

Fabric	**Q (g/m^2)**	**Density w/w* (threads/ cm)**	**Fineness (tex)**	**Weave**	**W_{CIE}**	**UPF****
CO	105	58.5/25	11.76 x 1	Plain	64.14	0
CO_OBA	105	58.5/25	11.76 x 1	Plain	126.9	10
PES/CO	105	56/28	13.3 x 1	Plain	70.1	10

Experimental

Fabric swatches were washed through 25 cycles with four detergent formulations of different composition, labeled as:

- *ECE - the reference ECE Color Fastness Test Detergent (Henkel) formulated according ISO 105-C06 in the concentration of 5 g/l, with the addition of sodium perborate tetra hydrate SPB4, according to the recommendation of the detergent producer in the concentration of 1 g/l (ECE).*
- *ECE detergent as described in a.) with the addition of 0.2% FWA per mass of ECE (ECE + FWA)*
- *ECE detergent as described in a.) with 0.2% UVA added (ECE + UVA)*
- *ECE detergent as described in a.) with 0.2% FWA and 0.2% UVA added (ECE + FWA + UVA).*

Experimental

The fluorescent whitening agent, 4,4′-bis-(sulfostyryl)-biphenyl disodium salt, Tinopal CBS-X (Ciba) was chosen as a component applicable for low temperature washing (LTW).

UV absorber, Tinosorb FD (Ciba), belongs to the chemical family of stylbene disulphonic acid triazine derivates.

The swatches of tested frabrics were washed 30 minutes at 40°C, in bath ratio 1:10, in the Linitest Apparatus (Original Hanau). After laundering, fabrics were rinsed with distilled water, squeezed and dried at 40°C for 45 minutes.

Results

Whiteness degree (W_{CIE}) of CO, CO_OBA and PES/CO fabrics before and after 1, 5, 10, 15, 20 and 25 washing cycles is shown in Fig. 1-3.

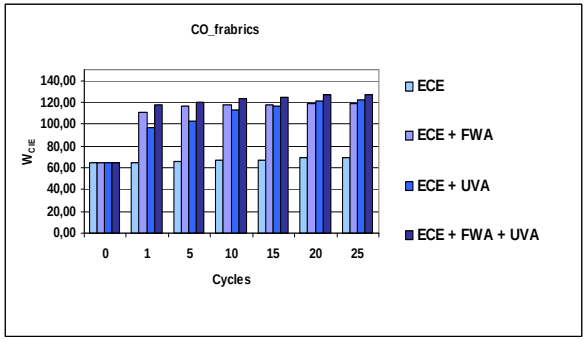

Figure 1: W_{CIE} of CO fabrics

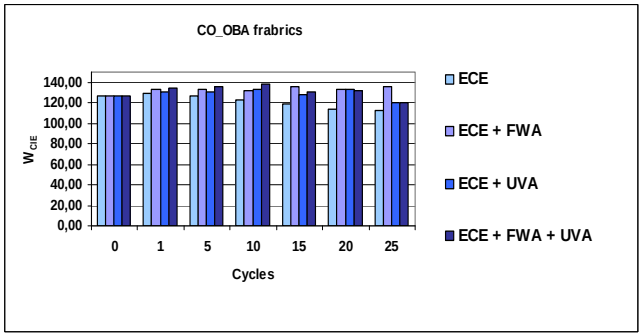

Figure 2: W_{CIE} of CO_OBA fabrics

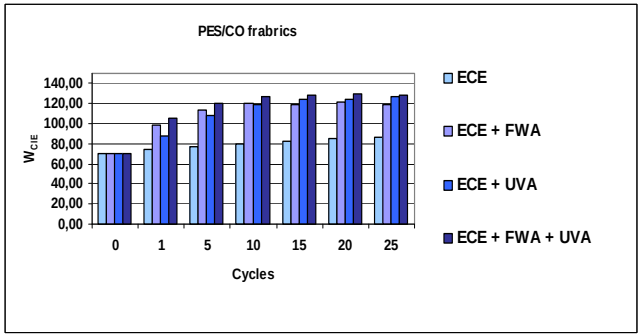

Figure 3: W_{CIE} of PES/CO fabrics

Results

UVR transmittance spectra through cotton fabrics and PES/cotton before and after washing in different detergent formulations is shown in Fig. 4-6.

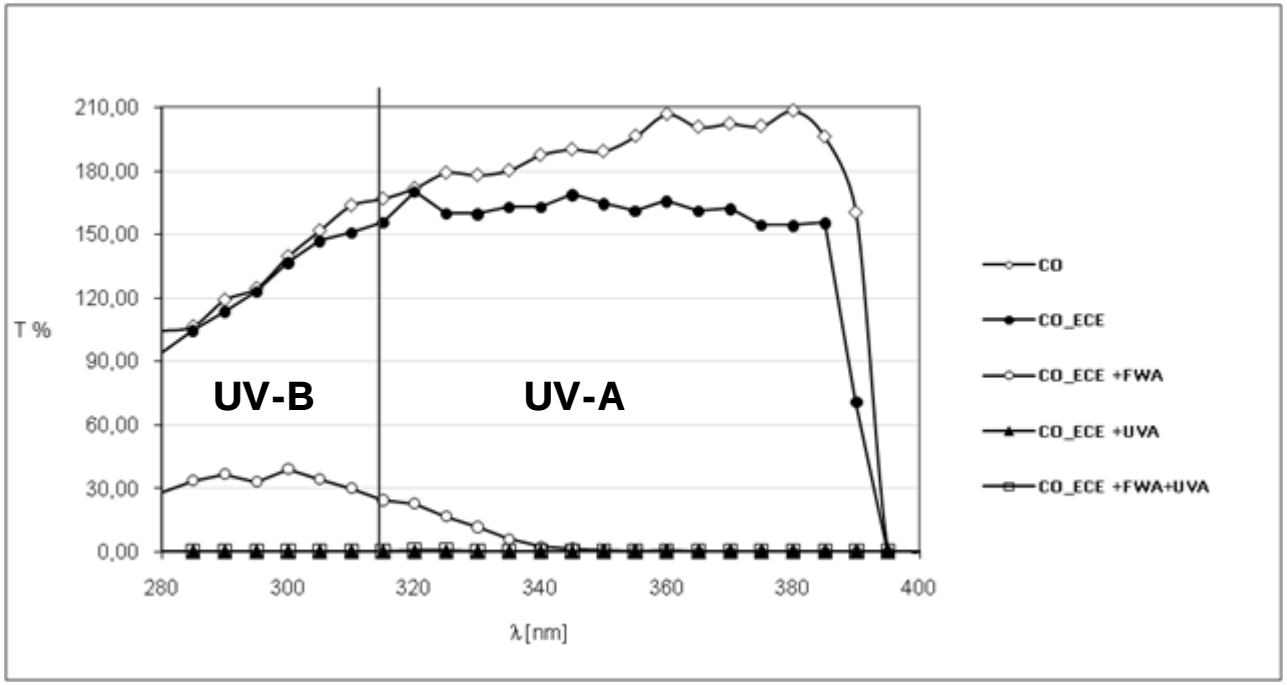

Figure 4: UVR transmittance spectra of CO fabrics

Results

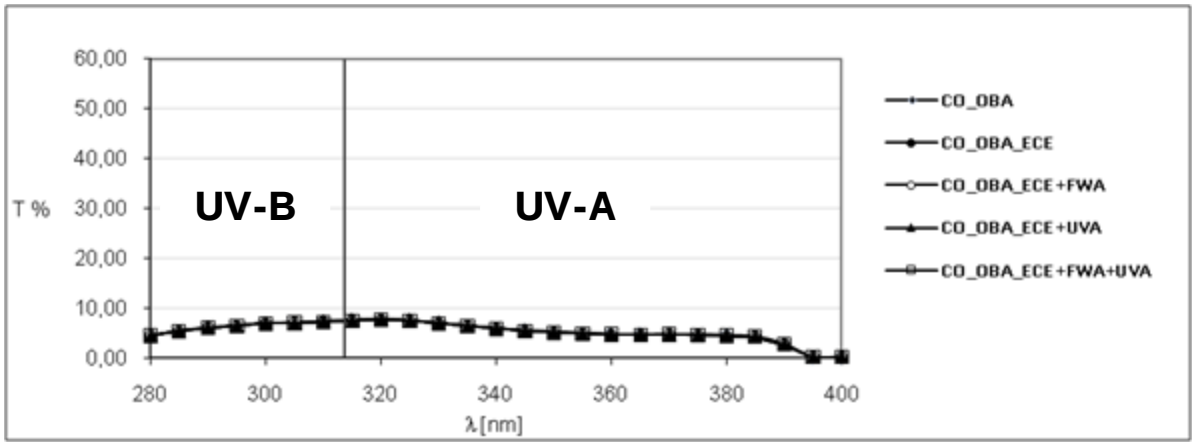

Figure 5: UVR transmittance spectra of CO_OBA fabrics

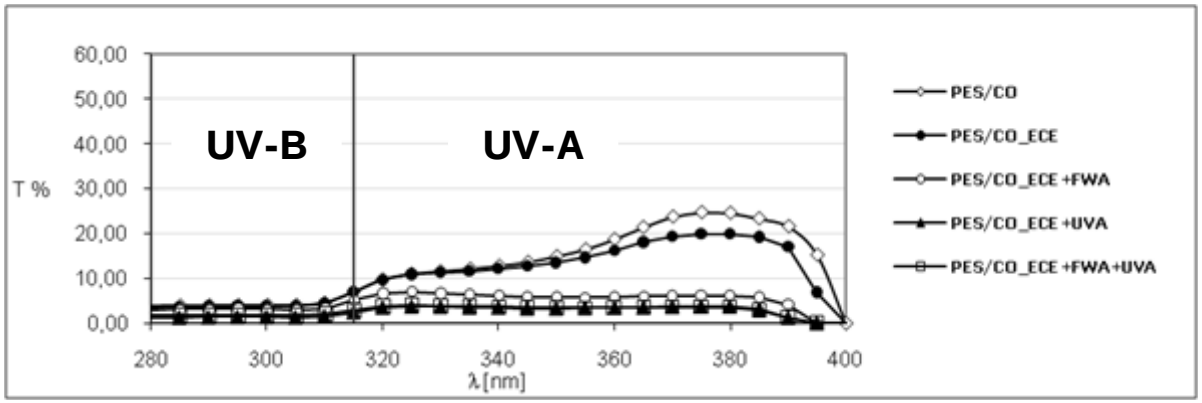

Figure 6:UVR transmittance spectra of PES/CO fabrics

Conclusions

Fluorescent compounds are very useful additives to detergents due to improved whiteness. The impact of the FWA is higher than of the UVA during the first cycles. The effect is equalized during multiple cycles. UV absorbing compounds provide better UV properties than fluorescent whitening agents, especially in UV-B region of spectra. Therefore, UV absorbers can be recommended additives due to multifunctional feature proved through improvement in whiteness and UV protection of washed textiles.

Acknowledgment

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Thank you on your attention