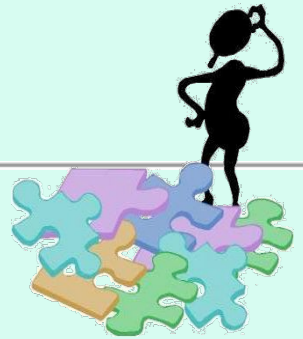
Behaviour of nitrospirobenzopyran photchromic dye in solvents and on PA fibre

Durasevic V.[1], Parac-Osterman D.[1], Sutlovic A.[1]

[1] University of Zagreb,
Faculty of Textile Technology,
Department of Textile Technology and Ecology
vedran.durasevic@ttf.hr



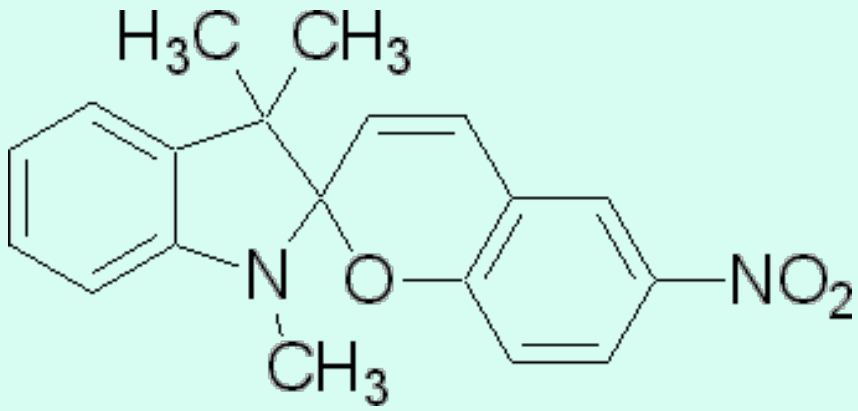
PROBLEM → ISSUE → GOAL

- **Photochromism of dye solutions**

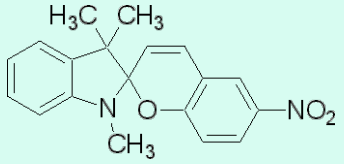
- **Dyeing process and colorimetric measurement**

Photochromism of dye solutions

1′,3′-Dihydro-8-methoxy-1′,3′,3′-trimethyl-6-nitrospiro[2*H*-1-benzopyran-2,2′-(2*H*)-indole]



1′,3′-Dihydro-8-methoxy-1′,3′,3′-trimethyl-6-nitrospiro[2*H*-1-benzopyran-2,2′-(2*H*)-indole]



DISSOLVING	**EtOAc** **AC**
CONC.	**0,048·10^{-3}, 0,160·10^{-3} and 0,228·10^{-3} mol/l**
EXPOSITION	**Solarscreen Test UV chamber STC-01** **- exposed at 23±1°C**
PHOTOTROPISM	**Fading was done by exposing to specter of visible light (light of 15W)**
MEASURE	**Spectral curves were obtained on Nanocolor® 500D spectrophotometer**

Solarscreen Test UV chamber STC-01

- equipped by series of five lamps with maximum emission at 320 and 350 nm

1′,3′-Dihydro-8-methoxy-1′,3′,3′-trimethyl-6-nitrospiro[2*H*-1-benzopyran-2,2′-(2*H*)-indole]

Dissloving	**AC and in EtOAc**

Aux. chem.	**D1 - CHT Dispergator SMS (aromatic sulphonate) and** **D2 - Meropan NX (polyacrylate with phosphonate)**

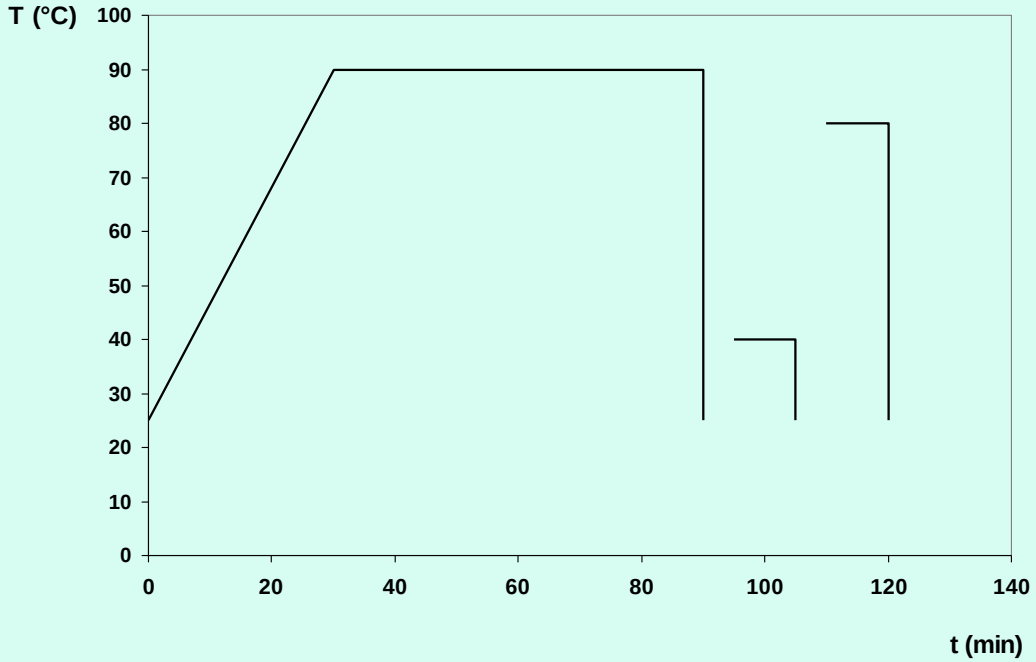
Dyed substrate	**PA 6 / According to process of exhaustion dyeing**
Apparatus used	**Polycolor Mathis***

Measure.	**K/S values and CIE coordinates (L*, a*, b*, C*, h) of the dyed substrates before and after irradiation and fade (exposure to light of 15W) were determined on remission spectrophotometer**

Apparatus used	**Spectraflash 600®- PLUS CT**

Dyeing process and colorimetric measurement

Exhaustion dyeing



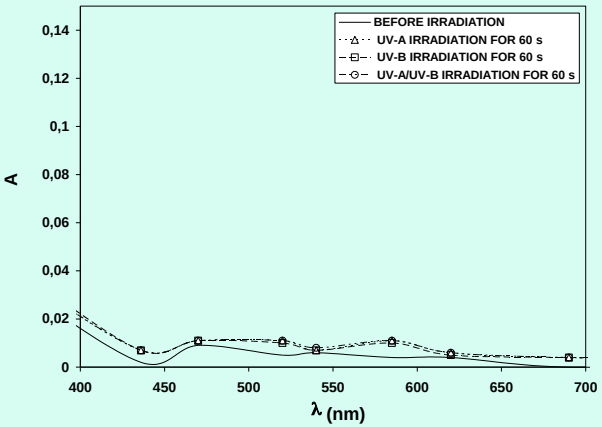
pH 4-5

LR 1:20

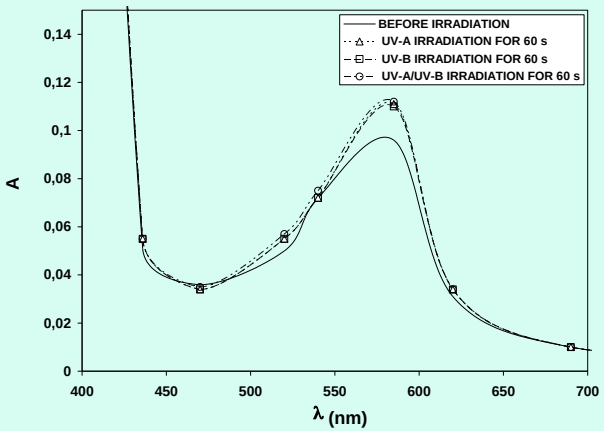
C_b=0,132% owof

RESULTS AND DISCUSSION

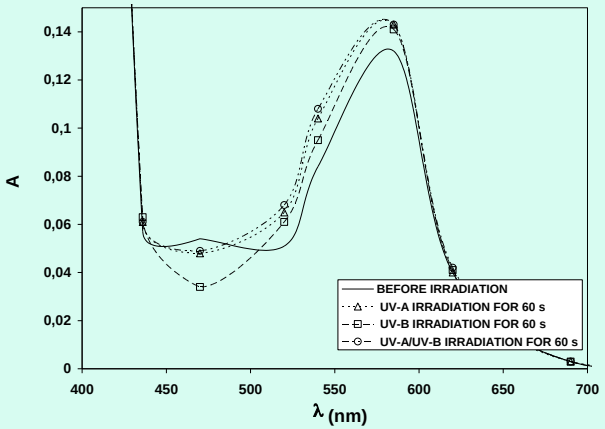
Photochromism of dye solutions



A. $c_{dye}= 0{,}048 \cdot 10^{-3}$ mol/l



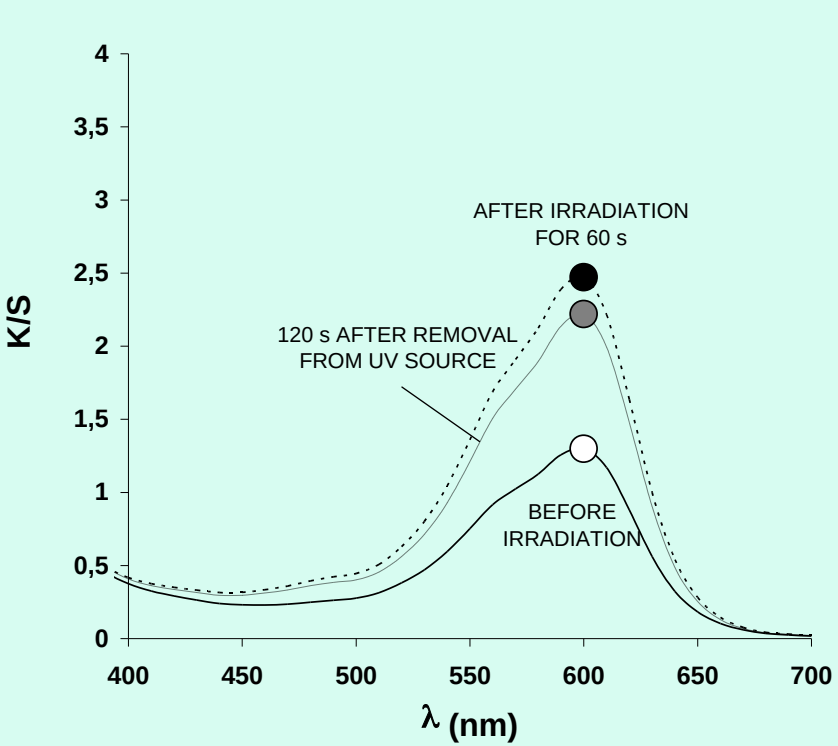
B. $c_{dye}= 0{,}160 \cdot 10^{-3}$ mol/l

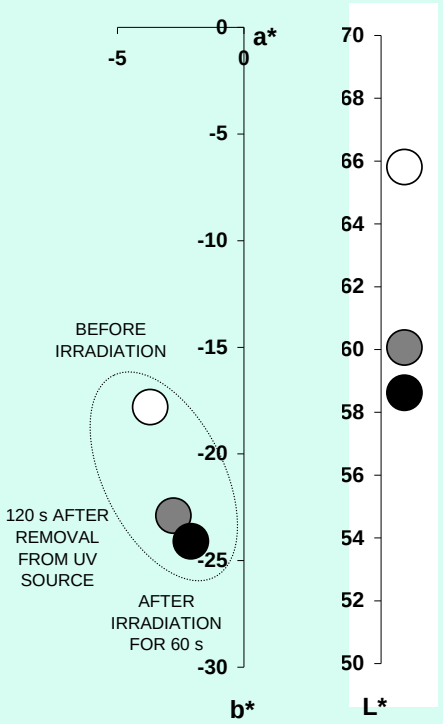


C. $c_{dye}= 0{,}228 \cdot 10^{-3}$ mol/l

The VIS spectrum of nitrospirobenzopyran dye in EtOAc

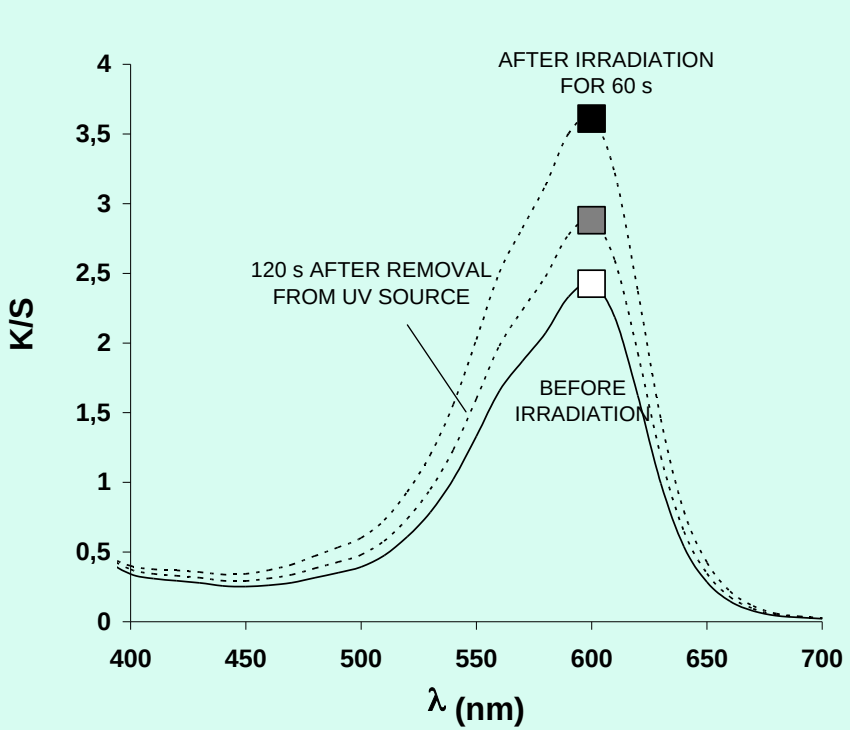
Dyeing process and colorimetric measurement

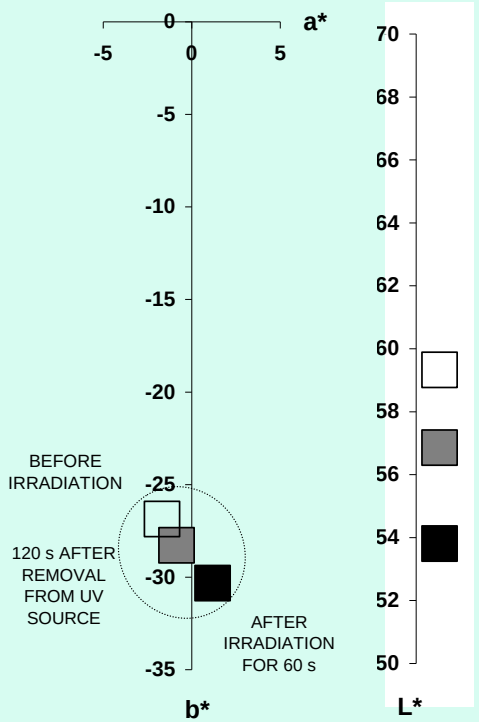




A. nitrospirobenzopyran dye + D_1 (solvent AC)

D1- CHT Dispergator SMS (aromatic sulphonate)





B. nitrospirobenzopyran dye + D_2 (solvent AC)

D2- Meropan NX (polyacrylate with phosphonate)

CONCLUSION

- based on obtained results no obvious photochromic behaviour of 1′,3′-Dihydro-8-methoxy-1′,3′,3′-trimethyl-6-nitrospiro[2*H*-1-benzopyran-2,2′-(2*H*)-indole] dye was reported

- dye was successfully dissolved in both EtOAc and AC no significant shifts in lmax of the absorption curves was observed

- photochromism was favoured by dissolving the dye in AC, which resulted in even dyeings and satisfactory dye exhaustion

- regarding quick response time of the dyed substrates to changes caused by altering lmax of the light source (irradiation time 60 s) conventional method of exhaustion dyeing should be considered as successful method of applying photochromic dyes to PA 6