

Contact person RISE

Stefan Källberg
Measurement Science and Technology
+46 10 516 56 26
stefan.kallberg@ri.se

Date

2020-05-08

Reference

MTt8P06668-02

Page

1 (3)

Intellego Technologies AB
Fatburs Brunnsgrata 30
118 28 STOCKHOLM
Sweden

UVC exposure (254 nm) of UV sensitive material at different irradiation levels

(1 appendix)

RISE Research Institutes of Sweden has evaluated the colour shift for a 1000 mJ/cm² UVC indicator after exposure to UVC irradiation at 254 nm. The colour of the samples after exposures of 0, 250, 500, 750 and 1000 mJ/cm² was measured and evaluated using the 1976 CIE Lab colour space.

Identification

Object	Yellow 1000 mJ/cm ² UVC indicator.
Object state	Upon arrival the sample had no visual damage and were without any colour changes.
Location	Borås, Sweden
Measurement date	May 07, 2020

Measurement methods and procedures

Small pieces of the sample were exposed by UV-radiation at 254 nm wavelength using a UVP Transilluminator equipped with fluorescent UVC-tubes. The irradiation level at the sample plane (about 1500 μW/cm²) was determined by a calibrated silicon detector with a precision aperture in front of the detector's photosensitive surface.

Each sample piece was exposed a certain time corresponding to exposure levels of 250, 500, 750 and 1000. The colour of the exposed sample area was measured using a spectrophotometer Perkin-Elmer Lambda 900 equipped with an Ø 150 mm integrating sphere, using the geometry 8°/total. Also, a picture of the sample was taken with the sample placed in a light both using D65 illumination with high colour rendering index (> 95).

Based on the colour coordinates in CIE 1976 L* a* b* colour space (reference illuminant CIE D65), the total colour difference ΔE* relative to a non-exposed sample was determined as:

$$\Delta E^* = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

where ΔL*, Δa* and Δb* are the differences between the individual coordinates.

RISE Research Institutes of Sweden AB

Postal address	Office location	Phone / Fax / E-mail
Box 857	Brinellgatan 4	+46 10 516 50 00
SE-501 15 BORÅS	SE-504 62 BORÅS	+46 33 13 55 02
Sweden		info@ri.se

This document may not be reproduced other than in full, except with the prior written approval of RISE.

Measurement conditions

Ambient temperature	23 ±2 °C
Sample temperature (during exposure)	30 ±5 °C
Exposure wavelength	254 ±2 nm

Results

The results only refer to the object specified in this document. Pictures of the sample at the different exposure levels are shown in the appendix.

Table 1. Measured colours and colour changes at different exposure levels.

Exposure mJ/cm ²	CIE 1976 L*a*b* colour coordinates			Colour difference ΔE*
	L*	a*	b*	
0	91,2	-5,9	46,7	0,0
250	82,1	10,3	17,2	34,8
500	80,2	15,9	3,8	49,3
750	79,5	18,0	-0,7	54,3
1000	79,3	19,6	-4,7	58,6

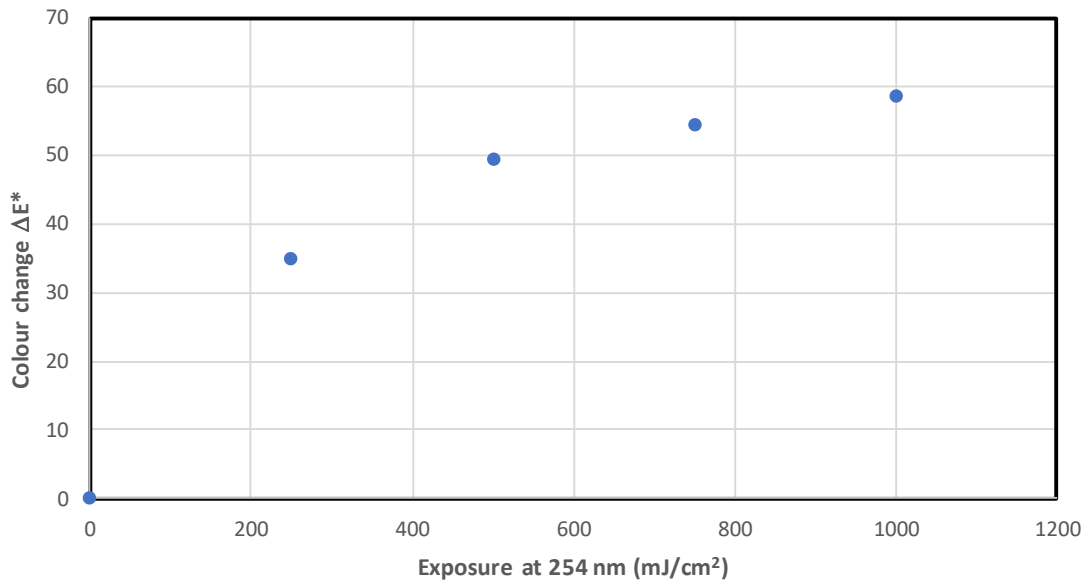


Figure 1. Colour change at different exposure levels relative to an unexposed sample-

The uncertainty is estimated to ±8 % of the reported exposure levels. The measurement uncertainty for L*, a* and b* is ±2,0.

Equipment

Reference silicon detector 10×10 mm, inv.no. 500963
UVP Transilluminator 254 nm, no. 95-0153-02
Picoammeter Keithley 6485, inv.no 603159
Precision aperture Ø 7,5 mm, inv.no. 502607
Spectrophotometer PE Lambda 900, inv.no. 503052
Accessory devise for geometry 8°/t, inv.no. 503059
Light booth True Color TC-60
Nikon D7000 digital camera

RISE Research Institutes of Sweden AB **Measurement Science and Technology - Time and Optics**

Performed by

Stefan Källberg

Appendix

Pictures of the samples at different exposure levels

Appendix 1

Pictures of the samples at different exposure levels