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Accelerated Weathering Testing of
Yellow & Grey PVC Swatches

Warmagrip™ UV Test Report

10 November 2008

Introduction

This report details the accelerated weathering testing of yellow and grey coloured PVC swatches to ISO 4892 part 3.

Test Regime

Test Standard

ISO 4892 part 3.

Test Regime

The test was run for a period of 500 hours, using UVA bulbs and the continuous cycling parameters detailed below:

Step	Function	Irradiance	Temperature	Duration
1	UV	0.76W/m ²	60°C	8:00 hrs
2	Condensation	-	50°C	4:00 hrs

Testing was performed using a QUV SE Accelerated Weathering Tester with Solar Eye irradiance control.

Colour check measurements were made using a Minolta Colourimeter, using the L*a*b colour space system (an explanation of this is attached). Checks were performed prior to and upon completion of the test.

Samples Supplied

Three yellow and three grey PVC swatches were supplied. Two yellow and two grey swatches were exposed in the weathering chamber; the remaining two swatches were retained as reference samples for comparison purposes.

Results

A summary of the results obtained are shown in the table below, full colourimeter results are shown in appendix 1. An explanation of the ΔE^*ab readings shown in the table is given in the explanation of the LAB colour space system at the end of this report.

Sample Description	500 hours	ΔE^*ab^*
Yellow swatches	Samples have discoloured in swirls (see fig. 1). Colour readings indicate significant greening and some blueing and darkening.	16.15
Grey swatches	Slight yellowing, not really visible to the naked eye.	2.28

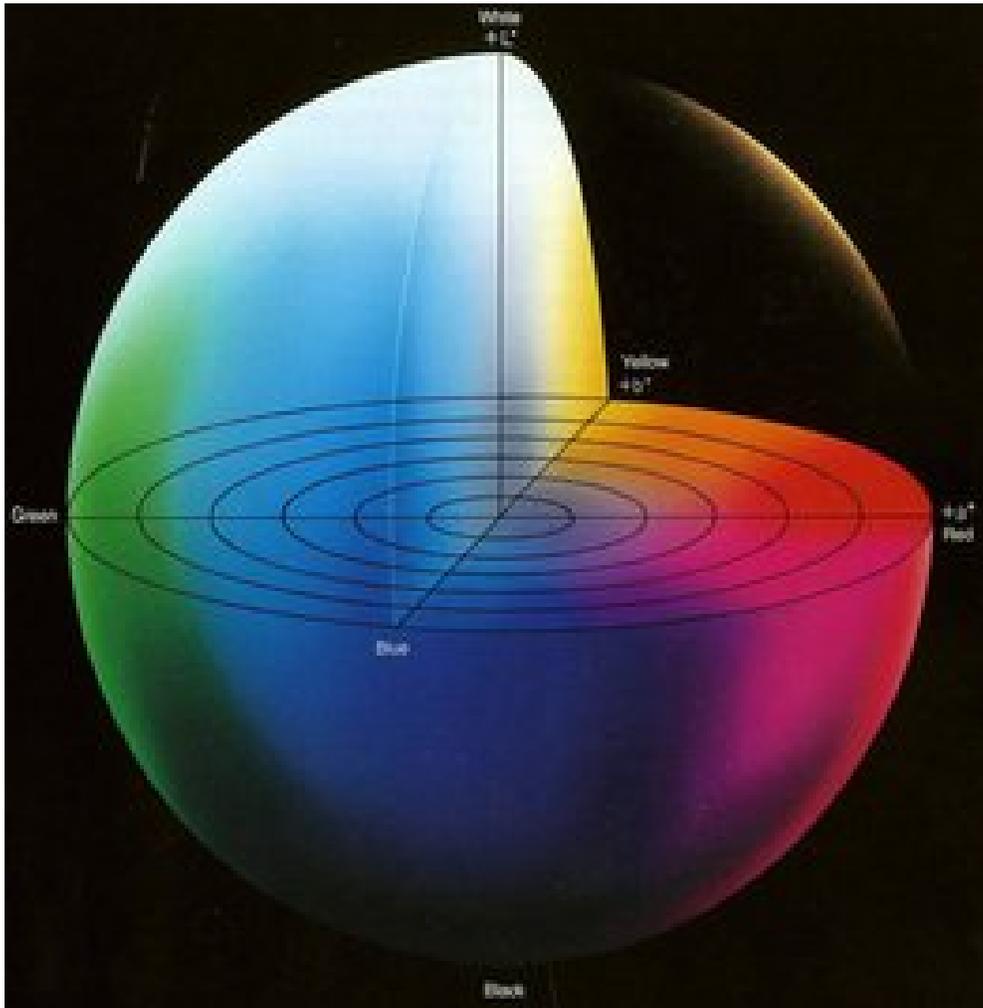
* An explanation of ΔE^*ab is given in the next section.

Explanation of the L*A*B Colour space system

Colorimeter readings were taken using the Lab colour space system; this defines the colour of an object as 3 dimensional coordinate within a colour sphere. The L coordinate represents lightness and runs from 100 (complete lightness) to 0 (complete darkness), a is the red direction $\acute{o}a$ is the green direction, +b is the yellow direction and $\acute{o}b$ is the blue direction. A graphical representation of this is shown below. Lab readings taken are an average over a 2mm spot size in each case.

Three colour readings were taken on each sample in the tested and untested state, these were averaged to give a single L, a & b figure. The readings are appended to this report.

In quoting overall colour difference values it is common to produce a single value (ΔE^*ab), this is produced using Pythagoras theorem and gives an absolute value for the size of the colour difference, but not the direction of change.



Graphical representation of the L*a*b* colour space model.



Fig. 1. Views of the samples post test (unexposed swatches are shown on the LHS).

Appendix 1. Full Colourimeter Results

	Pre Test			500 hours		
	L	A	B	L	A	B
Yellow	71.80	10.63	61.89	68.90	-5.07	58.02
	71.39	10.58	61.35	68.09	-4.18	57.18
	71.24	10.58	61.72	68.49	-4.94	57.44
Average	71.48	10.60	61.65	68.49	-4.73	57.55
			ΔE^*	-2.99	-15.33	-4.10
			ΔE^{*ab}	16.15		
Grey	44.85	-0.66	-1.40	44.35	-1.14	0.82
	44.58	-0.55	-1.23	43.94	-1.06	0.61
	44.55	-0.58	-1.37	43.93	-1.10	1.02
Average	44.66	-0.60	-1.33	44.07	-1.10	0.82
				-0.59	-0.50	2.15
			ΔE^{*ab}	2.28		