

Test report no.: 82377/08

Customer: LG Chemical Ltd.
Specialty Polymer Division
LG Twin Tower 20, Yoido-dong,
Youngdungpo-gu
150-721 SEOUL
KOREA

Order: Testing of colour fastness after artificial weathering according to RAL-GZ 716/1, section I, part 7, on window profiles made of PVC-U, laminated with several foils.

Artificial weathering according to EN 513, procedure 1 (simulation of a moderate climatic zone M) up to an irradiation dose of 12 GJ/m² in the wave length range between 300 nm to 800 nm.

Orally ordered: 2008-05-26 **by:** Mr Joon Seo

Test samples received on: 2008-05-21

Test period: 2008-05-29 to 2009-03-03

The test report comprises 6 pages.

Würzburg, 2009-03-23
Rs/ste

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Dr. Anton Zahn



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1. Order

The company LG Chemical Ltd., Specialty Polymer Division, LG Twin Tower 20, Yoido-dong, Youngdungpo-gu, 150-721 SEOUL, KOREA instructed the SKZ - TeConA GmbH by Mr Joon Seo to test the colour fastness after artificial weathering according to RAL-GZ 716/1, section I, part 7, on window profiles made of PVC-U, laminated with several foils. The artificial weathering to be carried out according to EN 513, procedure 1 (simulation of a moderate climatic zone M) up to an irradiation dose of 12 GJ/m² in the wave length range between 300 nm to 800 nm.

2. Test material

On May 21, 2008 SKZ - TeConA GmbH received following test material:

11 x 0.3 m window profile sections laminated with several foils.

Producer of base profile:	DIMEX, Nehren, GERMANY
Designation of base profile:	Frame 66 - 2101
Marking of profile:	DIMEX 18 210100 02 07 50  223
Lamination marking:	PBS 06.05.08 21:52

Assignment and designation of the individual foils:

Sample no.	Colour- and design no.	Marking of samples
1	KACH7 - U4/07	LG Chem NUTREX Outdoor KACH7-U4/07 0,2 MM (08.03.20)
2	YEL88 - U4/07	LG Chem NUTREX Outdoor YEL88-U4/07 0,2 MM (08.03.20)
3	UK101 - U4/07	LG Chem NUTREX Outdoor UK101-U4/07 0,2 MM (08.03.20)
4	UJ401 - S9/	LG Chem NUTREX Outdoor UJ401-S9/ 0,2 MM (08.01.15)
5	KDB75 - U4/07	LG Chem NUTREX Outdoor KDB75-U4/07 0,2 MM (08.03.20)
6	UK102 - U4/07	LG Chem NUTREX Outdoor UK102-U4/07 0,2 MM (08.03.20)
7	BER77 - U4/07	LG Chem NUTREX Outdoor BER77-U4/07 0,2 MM (08.03.20)
8	UJ301 - U4/07	LG Chem NUTREX Outdoor UJ301-U4/07 0,2 MM (08.03.20)
9	GAP45 -U4/07	LG Chem NUTREX Outdoor GAP45-U4/07 0,2 MM (08.03.20)
10	UK103 - U4/07	LG Chem NUTREX Outdoor UK103-U4/07 0,2 MM (08.03.20)
11	KDB74 - U4/07	LG Chem NUTREX Outdoor KDB74-U4/07 0,2 MM (08.03.20)



3. Test procedure

Following tests were carried out according to the Quality and Test Requirements "Plastic Window Profile Systems, Quality Assurance Guidelines, RAL-GZ 716/1, section I, plastic window profiles", test methods and requirements, part 7, window profiles made of PVC-U, laminated with film, edition March 2008.

The stated requirements were borrowed from the mentioned quality and test specification.

Unless otherwise noted testing was performed at a standard atmosphere of 23/50, class 1 in accordance with DIN EN ISO 291.

Usually we carry out tests according to standards for which we have an accreditation. The list of all standards for which we are accredited is shown on the homepage at www.skz.de.

3.1 Weathering fastness

The procedure of artificial weathering is based on the requirements according to DIN EN 513, procedure 1, **simulation of a moderate climate zone, M**.

Laminated outside surface was irradiated.

Parameters of the weathering device:

Type:	Xenon test device 1200 CPS
Radiation source:	Xenon arc radiation
Filter system:	outdoor sun light simulation
Black standard temp.:	60 ± 3 °C
White standard temp.:	40 - 45 °C
Relative humidity:	65 ± 5 %
Spray cycle:	18 min. water spray, 102 min. dry period
Irradiation energy E _{UV} (300 - 400) nm:	60 ± 2 W/m ²
Irradiation dose (300 - 800) nm:	12 GJ/m²
Exposure period:	6160 h
Start:	2008-06-04
End:	2009-03-02



3.1.1 Visual assessment

Visual assessment was carried out according to ISO 105-A02 by using the grey scale for assessing change in colour.

Requirement:

Upon termination of artificial weathering, the colour change must not be greater than allowed by grade 3 of the grey scale according to ISO 105-A02. Changes must not bring about stains, bubbles, streaks or cracks. There must not be any cracks and flake-off in the polyacrylate protective layer. A peel-off of the coating between the polyacrylate protective layer and the base foil as well as between the base foil and the PVC-U-profile must not occur.

In addition the visual assessment was carried out by using the grey scale for assessing staining according to ISO 105-A03.

Requirement:

None

3.1.2 Colourimetric assessment

The sample colour was measured by means of a spectrophotometer of a wave length area of 360 - 750 nm, standard light type D65, gloss inclusion, 10° normal inspection.

It was determined the colour distance ΔE^*_{ab} according to ISO 7724-3.

Each sample was measured before and after artificial weathering at the same measuring position on the sample, upon identical sample placement.

Due to that, also in case of the not single-coloured foils with surface texture, a guide value for colour change can be determined in terms of colourimetry.

Requirement:

None



4. Test results

4.1 Weathering fastness

4.1.1 Visual assessment

Sample no.	Colour / design-no.	Fastness grade acc. to ISO 105		Remark
		A02	A03	
1	KACH7 - U4/07	4 - 5	4 - 5	darker
2	YEL88 - U4/07	4 - 5	4 - 5	more red
3	UK101 - U4/07	4 - 5	4 - 5	more yellow
4	UJ401 - S9/	4 - 5	4 - 5	more red
5	KDB75 - U4/07	4 - 5	4 - 5	darker
6	UK102 - U4/07	4	4 - 5	brighter, more yellow
7	BER77 - U4/07	4 - 5	4 - 5	darker
8	UJ301 - U4/07	4 - 5	4 - 5	brighter, more red, more yellow
9	GAP45 -U4/07	4 - 5	4 - 5	more yellow
10	UK103 - U4/07	4 - 5	4 - 5	more yellow
11	KDB74 - U4/07	4 - 5	4 - 5	darker, more yellow

No stains, bubbles or streaks were found on any sample surface.

No crack formation or flake off was found on the polyacrylate protective layer of any sample. A peel-off of the base foil from PVC-U-profile did not occur.



4.1.2 Colourimetric assessment

Proben-Nr.	Colour / design no.	Colour distance			
		ΔL^*	Δa^*	Δb^*	ΔE^*_{ab}
1	KACH7 - U4/07	-0.2	0.0	0.1	0.2
2	YEL88 - U4/07	-0.3	0.0	0.1	0.3
3	UK101 - U4/07	0.0	-0.2	1.0	1.0
4	UJ401 - S9/	-0.4	-0.1	0.6	0.7
5	KDB75 - U4/07	-0.6	0.1	0.3	0.7
6	UK102 - U4/07	0.1	-0.2	1.0	1.0
7	BER77 - U4/07	-0.4	-0.1	0.2	0.5
8	UJ301 - U4/07	-0.3	0.1	0.5	0.6
9	GAP45 -U4/07	-0.5	0.1	0.3	0.6
10	UK103 - U4/07	-0.2	0.0	0.5	0.5
11	KDB74 - U4/07	-0.4	0.2	0.4	0.6

5. Assessment of the test results

The requirements of item 2.13.1 (colour fastness after artificial weathering) according to RAL-GZ 716/1 section I, part 7, edition March 2008 are met by all tested foils.

