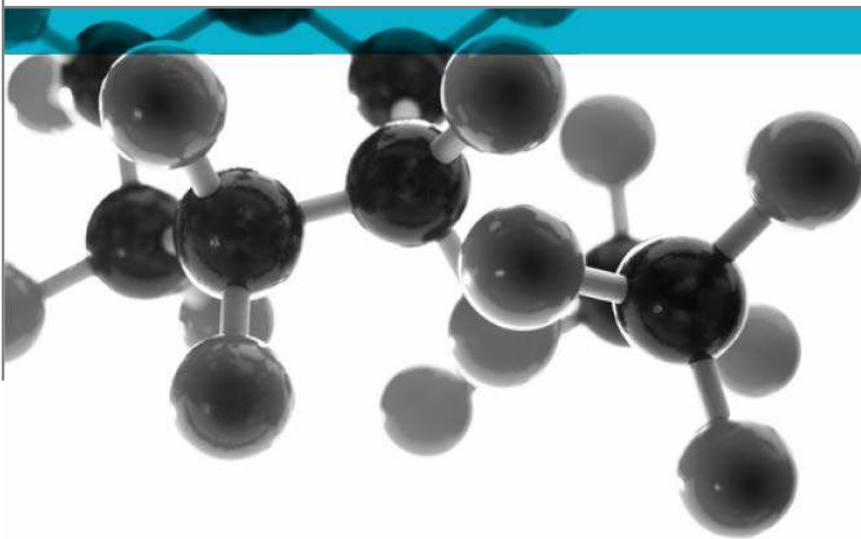


BS 6853:1999: Annex B.2 (Withdrawn) / LUL S1085 Attachment A.2



**Determination of weighted summation of toxic
fume, R – Area based test method**

A Report To: Pulver Kimya San. Ve Tic. A.Ş.

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Page 1

Testing
Advising
Assuring

Executive Summary

Objective To determine the toxic fume produced from the following product when tested in accordance with BS 6853: 1999 incorporating amendment No. 1: Annex B.2 (Withdrawn) / LUL S1085 Attachment A.2:



Generic Description	Product reference	Thickness	Weight per unit area or density
Polyester coated aluminium plate	Not stated	3.12-3.14mm	1.64g/cm ³
Individual components used to manufacture composite:			
Coating	"Polyester Powder Coatings"	60 - 70µ	1.58g/cm ³
Aluminium	"Aluminium Plate"	3mm	2.7g/cm ³
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor Pulver Kimya San. Ve Tic. A.Ş., GOSB Tembelova Alanı 3200, Sokak No: 3201, Gebze, 41400 Kocaeli, Turkey.

Summary of Test Results: **The R Value determined was 0.32.**

Date of Test 25th May 2017

Signatories

	
Responsible Officer T. Mort * Senior Technical Officer	Authorised S. Deeming * Business Unit Head

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 2nd June 2017

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Test Details

Introduction

Exova Warringtonfire was commissioned to carry out an area based toxicity test in accordance with the method recommended in BS 6853:1999 Incorporating Amendment 1, Informative Annex B.2 (Withdrawn) / LUL S1085 Attachment A.2. This standard recommends that the test is carried out using the apparatus detailed in prEN2824 but the ignition cone used should conform with the requirements given in BS ISO 5659-2 and that the quantitative determination of the gases emitted should be carried out in accordance with the procedure specified in prEN2826.

The test was performed in accordance with the procedure specified in prEN2825 and prEN2826 amended in accordance with the recommendations given in BS6853: 1999 Annex B (Withdrawn) / LUL S1085 Attachment A.2 and this report should be read in conjunction with these and other related standards.

Test method

The principle of the test methods detailed in prEN2825 and prEN2826 is to expose a material to specified thermal conditions of pyrolysis and combustion in a continuous procedure. The change in optical density of the smoke produced when dispersed within a fixed volume of air is recorded throughout the period of test. Quantitative determination of toxic gases emitted is carried out using wet analysis.

The test method provides a means for the comparative assessment of products, however, it does not model a real fire situation and the results cannot therefore be used to describe the fire hazard of materials under actual fire conditions.

Fire test study group/EGOLF

Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and has agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.

Instruction to test

The test was conducted on the 25th May 2017 at the request of Pulmer Kimya San Ve Tic A.S, the sponsor of the test.

Provision of test specimens

The specimens were supplied by the sponsor of the test. **Exova Warringtonfire** was not involved in any selection or sampling procedure.

Conditioning of specimens

The specimens were received on the 18th April 2017.

The specimens were conditioned at temperatures of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ RH, for a minimum period of 24 hours prior to testing.

Test Face

The coated face of the specimen was exposed to the radiant heat source.

Description of Test Specimens

The description of the specimens given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description		Aluminium plate coated by polyester powder coating
Product reference		See Note 1 Below
Name of manufacturer		See Note 1 Below
Thickness		3.12 and 3.14mm (stated by sponsor) 3.22mm (determined by Exova Warringtonfire)
Density		1.64g/cm ³ (stated by sponsor) 2.57g/cm ³ (determined by Exova Warringtonfire)
Product configuration		<ul style="list-style-type: none"> • Coating • Polyester • Coating
Coating	Generic type	Polyester
	Product reference	"Polyester Powder Coatings"
	Name of manufacturer	PULVER KİMYA SAN. VE TİC. A.Ş.
	Colour reference	"Grey" (Observed by Exova WarringtonFire)
	Number of coats	One
	Application thickness per coat	Between 60 and 70μ
	Density	1.58g/cm ³
	Application method	Electrostatic spray
	Flame retardant details	See Note 1 Below
	Curing process per coat	See Note 1 Below
Substrate	Generic type	Aluminium
	Product reference	"Aluminium Plate"
	Name of manufacturer	See Note 1 Below
	Thickness	3mm
	Density	2.7g/cm ³
	Colour reference	See Note 1 Below
	Flame retardant details	See Note 1 Below
Brief description of manufacturing process		See Note 1 Below

Note 1: The sponsor was unwilling to provide this information.

The description of the specimens as given above is not as detailed as would usually be the case for descriptions included in **Exova Warringtonfire** test reports and the description may not fully comply with the requirements of the test standard. In all other respects however the tests were conducted fully in accordance with the requirements of the test standard and the test results are valid.

Test Procedure

Specimens were tested in the flaming mode in a horizontal position by exposure to the heating arrangement specified in ISO 5659-2. The heat flux was 25kW/m^2 .

The sampling and analysis of the fire gases generated during the test is conducted using a variety of methods as defined in the internal operating procedure.

In all cases, the sample is taken from the geometric centre of the chamber with sample lines being kept as short as possible to minimise sample losses.

For the analysis of oxides of carbon and nitrogen, continuous measurements are made throughout the duration of the test.

Carbon dioxide (CO_2), carbon monoxide (CO) and oxides of nitrogen (NO_x) are determined continuously using a precalibrated Fourier Transform Infra-Red analyser. The values reported are those measured at 85% smoke obscuration.

For the other gases, single point analysis is conducted, the gases being absorbed into an aqueous media and analysed remotely. Two types of media are used, 0.1M sodium hydroxide solution and 0.3% hydrogen peroxide solution. The gases are sampled over a two minute period commencing when smoke density has reached 85% obscuration by bubbling the gases through the aqueous media using a fitted funnel Dreschel bottle arrangement.

Hydrogen cyanide (HCN) is determined from gases absorbed into a 0.1M solution of sodium hydroxide and analysed using ion chromatography. The concentration determined is an average over each 2 minute period beginning at 85% smoke obscuration.

Hydrogen chloride (HCl), hydrogen bromide (HBr), hydrogen fluoride (HF) and sulphur dioxide (SO_2) are absorbed into a 0.3% solution of hydrogen peroxide and are also analysed by ion chromatography. The concentration determined is an average over each 2 minute period beginning at 85% smoke obscuration.

Test Results

Applicability of test results

The test results relate only to the behaviour of the specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and will therefore invalidate the test results. It is the responsibility of the supplier of the product to ensure that the product which is supplied is identical with the specimens which were tested.

Gases sampled

One specimen was tested to determine the $D_{s_{max}}$ and time to $D_{s_{max}}$. From the results of this test time to reach 85% of $D_{s_{max}}$ was calculated. The results are given below:

$D_{s_{max}}$	45
Time to $D_{s_{max}}$ (T_{max})	20:00
Time to 85% of $D_{s_{max}}$ (T_{max} 85%)	18:43

Three further specimens were then tested. Gases generated were sampled after 18 minutes 43 seconds test duration. The quantitative determinations were then carried out using the procedures described. The test results obtained are provided below and test observations are detailed in Table 1.

Gas	Specimen No. 1	Specimen No. 2	Specimen No. 3	Average
Carbon Monoxide	3.82	6.23	5.23	5.09
Carbon Dioxide	1664.19	1476.07	1438.32	1526.19
Sulphur Dioxide	ND	ND	ND	ND
Hydrogen Chloride	ND	ND	ND	ND
Hydrogen Bromide	ND	ND	ND	ND
Hydrogen Fluoride	ND	ND	ND	ND
Hydrogen Cyanide	ND	ND	ND	ND
Nitrogen Oxides	1.49	1.49	1.49	1.49

Where: ND indicates non-detected.
 Note: All values given are in g/m^2 .

Weighted Summation of Toxic Fume, R

The test results obtained for toxicity measurements were used to calculate the weighted summation index, R, as described in BS 6853: 1999: Annex B.4.2 (Withdrawn) / LUL S1085 Attachment A.4.2.

The R Value determined was 0.32.

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

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Table 1

Testing with Flame Application									
Specimen	D _s after t in minutes							D _s max. within 1.5 min	D _s max. within 4 min
	1	1.5	2	3	4	5	6		
Smoke run	0	0	0	0	0	1	1	0	0

Observations during test

Specimen No.	Initial Smoke Production Test	Toxicity Tests		
		1	2	3
Colour of smoke produced	Dark	Dark	Dark	Dark
Expansion distance towards heater (mm)	N/A	N/A	N/A	N/A
Ignition time in seconds (if applicable)	N/A	N/A	N/A	N/A
Extinction time in seconds (if applicable)	N/A	N/A	N/A	N/A
N/A = Not Applicable				

Revision History

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Revised By:	Approved By:
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