

EVA 乙烯-醋酸乙烯共聚物&PEVA

十分普及的環保塑材

File No.P/P01a-18

31 Oct 2007

現時國際上有很多限制 PVC，即聚氯乙烯，的條例及指令。主要原因是 PVC 裡的有害物質及不能生物降解的特性。生產商及名牌商爲了減少違反國際限制的風險以及增強其市場形象，正紛紛選用一些新式環保塑材來代替 PVC。

時至今日，EVA，即乙烯-醋酸乙烯共聚物是最可代替 PVC 的一種環保塑材。EVA 的成本相對於 PVC 並不昂貴，但是 EVA 本身對環境並不會造成損害。言而，EVA 的用途及效果與 PVC 十分類同，但是 EVA 絕對可避免大部份有關毒性的國際條例，因此 EVA 是塑膠業未來的新趨勢。

什麼是 EVA(乙烯-醋酸乙烯共聚物)?

EVA 是一種塑膠物料由乙烯(E)及乙烯基醋酸鹽(VA)所組成。這兩種化學物質比例可調較從而符合不同的應用需要， 乙烯基醋酸鹽 (VA content) 的含量越高，其透明度、柔軟度及堅韌度會相對提高。與 PVC 不同，EVA 的柔軟度是不能靠增塑劑的份量來調較的。

什麼是 PEVA(聚乙烯醋酸)?

PEVA 是一種塑膠物料由聚乙烯 (PE)及乙烯-醋酸乙烯共聚物(EVA)所組成。這兩種化學物質比例亦可調較從而符合不同的應用需要。聚乙烯比乙烯-醋酸乙烯共聚物爲重。當聚乙烯的比例越高，PEVA 的硬度及強度亦會相對提高，但是純聚乙烯是不可用高周波電壓，因此聚乙烯的比例越高，PEVA 的電壓效果會越差。

EVA 及 PEVA 的特點是什麼?

- ✓ 可生物降解
棄掉或燃燒時不會對環境造成傷害
- ✓ 與 PVC 價格相近
EVA 的價格比有毒的 PVC 略高，但對比不含鄰苯二甲酸鹽之 PVC 則較為平宜
- ✓ 重量較輕
EVA 的密度介乎 0.91 至 0.93，而 PVC 則為 1.32
- ✓ 不含臭味
EVA 不含像阿摩尼亞(ammonia)或其他有機氣味
- ✓ 不含重金屬
符合有關國際的玩具條例(EN-71 Part 3 及 ASTM-F963)
- ✓ 不含鄰苯二甲酸鹽
適合兒童玩具及不會產生增塑劑釋出危險
- ✓ 高透明，柔軟及堅韌度
應用範圍十分廣闊
- ✓ 超強耐低溫(-70C)
適合結冰環境
- ✓ 抗水，鹽份及其他物質
在大部份的應用情況下都能保持穩定
- ✓ 高熱貼性
可牢固地貼於尼龍，蘇綸，帆布及其他布類
- ✓ 低貼合溫度
可加快生產速度
- ✓ 可絲印及柯式印刷
可用於更多花巧的產品(但必須用 EVA 類的油墨)

EVA 及 PEVA 的弱點是什麼?

- × 容易刮花
EVA 的表面較 PVC 容易被刮花，這可能影響產品的外表
- × 較低溶點
EVA 是不適合用於太高溫的環境(90 °C)
- × 拉力較弱
EVA 是不適合用於要求拉力較強的用途，如吹氣產品

不含各種有害物質:

- ◇ 重金屬
- ◇ 鄰苯二甲酸鹽
- ◇ 偶氮
- ◇ 五氯酚
- ◇ 有機錫
- ◇ 甲醛
- ◇ 多環芳烴
- ◇ 壬基苯酚
- ◇ 短鏈氯化石蠟

符合國際條例及指令:

- ✓ EN-71 Part 3 重金屬要求
- ✓ EN 1122 鎘含量 < 100ppm
- ✓ EN-71 Part 9 有機化學物質要求
- ✓ 鄰苯二甲酸鹽指令(2005/84/EC)
- ✓ 食物包裝指令 (2002/72/EC) 及美國藥物及食物管理局 FDA 條例
- ✓ 有害物質限制 RoHS 及 WEEE
- ✓ EN-71 Part 2 防火 (選擇性), 等等。

EVA 薄膜應用範圍, 包括:

- 兒童產品: 軟身玩具、文具、書本及嬰兒照顧產品
- 包裝: 食物包裝及玩具包裝
- 日常生活用品: 液體及食物容器、鞋材、紡織衣服、流行手袋及飾物、雨衣、雨傘
- 醫療用品: 手套及面罩, 可棄置的醫療袋
- 家庭用品: 浴簾、枱墊、枱布、用完即棄枱布、衣袋、西裝袋、椅套、床鋪、枕頭套、鞋套

EVA 薄膜類別

我們現時可提供透明或有色高質量的 EVA 薄膜，包括不同硬度或不同的爽手程度 (提醒: 與 PVC 不同, EVA 的柔軟度是不能靠增塑劑的份量來調校的)

產品類別	EVA				PEVA						TPEVA	PE
	AII	BII	C	G	A20	A50	A80	B20	B50	B80	E	
絲印	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
電壓	★★★★	★★★★★	★★★	★★	★★★	★★	★	★★★★	★★	★	★★★★★	Not OK
軟度	★★★★	★★★★★	★★★	★★	★★★★★	★★★★	★★★	★★★★★	★★★★★	★★★★	★★★★★	★★★★
耐刮	★★★	★★	★★★★★	★★★★★	★★★	★★★★	★★★★★	★★★	★★★★★	★★★★★	★★	★★★★★
回彈力	★★★★★	★★★★★	★★★★★	★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
拉伸力	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★	★★★	★★★★★	★★★★★	★★★	★★★★★	★★
可用爽手劑量	E0-E7	E0-E7	E0-E5	E0-E3	E0	E0	E0	E0	E0	E0	E0	E0
透明	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★	★★★	★★★★★	★★★	★★★	★★★	★★★★★
價格	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★	★★	★★★★★	★★★	★★	★★★	★

爽手級別	E0 (止滑)	E1	E2	E3	E4	E5	E6	E7 (水晶滑)
爽手程度	低	—————▶						高

★ 以上物理程度是對比數值，並不代表絕對數值

Test Report

No. 2026539/JL

Date: Mar 23 2006

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Report on the submitted sample said to be EVA FILM (SIZE 0.19X48 ET001).

SGS Job No. : 1999861
Style / Item No. : EVA/All
P.O. No. : FYIMC/031892-3
Country of Origin : CHINA
Sample Receiving Date : MAR 15 2006
Testing Period : MAR 15-20 2006

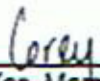
Test Requested : To determine the Soluble Heavy Metal contents in accordance with the European Standard on Safety of Toys, EN 71 Part 3:1994 + A1:2000 – Migration of Certain Elements.

Test Method : With reference to EN 71 Part 3:1994 + A1:2000. Analysis was performed by Inductively Coupled Argon Plasma – Atomic Emission Spectrometry.

Test Results : Please refer to the next page.

Conclusion : When tested as specified, the submitted sample complies with the Soluble Heavy Metal requirements stated in European Standard EN 71 Part3:1994 + A1:2000. (Note : EN 71:1994 + A1:2000, BS EN71:1995 and BS5665:1995 are identical)

Signed for and on behalf of
SGS Hong Kong Ltd.

for 
Lal Ka Yan, Margaret
Section Manager

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Test Results :

<u>Test Item</u>	<u>1</u>	<u>Limit</u>
Soluble Lead (Pb)	< 5 mg/kg	90 mg/kg
Soluble Antimony (Sb)	< 5 mg/kg	60 mg/kg
Soluble Arsenic (As)	< 5 mg/kg	25 mg/kg
Soluble Barium (Ba)	< 10 mg/kg	1000 mg/kg
Soluble Cadmium (Cd)	< 5 mg/kg	75 mg/kg
Soluble Chromium (Cr)	< 5 mg/kg	60 mg/kg
Soluble Mercury (Hg)	< 6.7 mg/kg	60 mg/kg
Soluble Selenium (Se)	< 10 mg/kg	500 mg/kg

Sample Description :

1. Transparent EVA

- Note :
1. < = less than
 2. mg/kg = milligram per kilogram
 3. Results shown are of the adjusted analytical result.

*** End of Report ***

Test Report

No. 2026540/JL

Date: Mar 22 2006

Page 1 of 2

Report on the submitted sample said to be EVA FILM (SIZE 0.19X48 ET001).

SGS Job No. : 1999863
Style / Item No. : EVA/All
P.O. No. : FYIMC/031892-3
Country of Origin : CHINA
Sample Receiving Date : MAR 15 2006
Testing Period : MAR 15 - 20 2006

Test Requested : To determine the DBP, BBP, DEHP, DINP, DNOP and DIDP phthalate contents in accordance with European Directive 1999/815/EC.


Test Method : With reference to ASTM Method Designation D3421-75. Analysis was performed by Gas Chromatography / Mass Spectrometry.

Test Results : Please refer to next page.

Conclusion : When tested as specified, the submitted sample complies with the phthalate requirements stated in European Directive 1999/815/EC.

— Tested Sample Returned —

Signed for and on behalf of
SGS Hong Kong Ltd.


Lai Ka Yan, Margaret
Section Manager

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Test Results

<u>Test item</u>		<u>1</u>	<u>Detection Limit</u>	<u>Limit</u>
Dibutyl Phthalate	(DBP)	ND	0.003%	0.1%
Benzylbutyl Phthalate	(BBP)	ND	0.003%	0.1%
Bis-(2-ethylhexyl) Phthalate	(DEHP)	ND	0.003%	0.1%
Diisononyl Phthalate	(DINP)	ND	0.01%	0.1%
Di-n-octyl Phthalate	(DNOP)	ND	0.003%	0.1%
<u>Diisodecyl Phthalate</u>	<u>(DIDP)</u>	<u>ND</u>	<u>0.01%</u>	<u>0.1%</u>
Total (DBP+BBP+DEHP+DINP+DNOP+DIDP)		< 0.05%	—	0.1%

Sample Description :

1. Transparent Plastic

Note : 1. ND = not detected
2. % = percentage by weight

*** End of Report ***

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STC Test Report

Date : 2006-11-03
No. : HC188009

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Applicant(Code:HIF002)


Description of Samples : One submitted sample said to be EVA 薄膜 (0.3*48").
Color : ET001
Style :
Item No.: EVA/AllCa
Reference No.: BDA</06-1752-1

Date Samples Received : 2006-10-23

Date Tested : 2006-10-31 to 2006-11-02

Investigation Requested : FDA test in accordance with 21 CFR 177.1350 – EVA Material
- Total extractable matter in distilled water at 120°F for 24 hours
- Total extractable matter in n-heptane at 70°F for 30 minutes
- Total extractable matter in 8% alcohol at 120°F for 24 hours
- Total extractable matter in 50% alcohol at 120°F for 24 hours

Conclusion : The test results of the submitted sample complied with the FDA test requirements in accordance with 21 CFR 177.1350.


Jacky Lo, CFD
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.



The Hong Kong Standards and Testing Centre Ltd.

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STC Test Report

Date : 2006-11-03
No. : HC188009

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Method(s) Used:

Ref. 21 CFR 177.1350

Test Result(s):

Ref. 21 CFR 177.1350

Test Item(s)	Form Liner (EVA Material)	Specification
- Total extractable matter in distilled water	<0.1 mg/in ²	0.5 mg/in ² max.
- Total extractable matter in n-heptane	<0.1 mg/in ²	0.5 mg/in ² max.
- Total extractable matter in 8% alcohol	<0.1 mg/in ²	0.5 mg/in ² max.
- Total extractable matter in 50% alcohol	<0.1 mg/in ²	0.5 mg/in ² max.

Notes: < denotes less than
mg/in² denotes milligram per inch square

***** End of Test Report *****

The Hong Kong Standards and Testing Centre Ltd.

10 Dal Wang Street, Tolo Industrial Estate, H. T., Hong Kong
Tel: (852) 2656 1888 Fax: (852) 2654 4350 E-mail: hkstc@hkstc.org Homepage: www.hkstc.org

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Prüfbericht - Nr.: 143060043a 001

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Test Report No.:

Page 1 of 4

Auftraggeber:

Client:

Gegenstand der Prüfung: Toy component

Test Item:

Wareneingangs-Nr.: 080429582

Receipt No.:

Bezeichnung:

Identification:

EVA/A II - COLOR: GREEN - EVA FILM

ITEM NO.: T029-08(16)

Anlieferungszustand:

Delivery condition:

**Einwandfrei, Prüfgegenstand
 getestet wie angeliefert**

Apparent good, Samples tested
 as received

Eingangsdatum: 29 Apr. 2008

Date of Receipt:

Prüfort:

Testing Location:

TÜV Rheinland Hong Kong Ltd.

Prüfgrundlage:

Test Specification:

Customer requirement:

Polynuclear aromatic hydrocarbons (PAHs)

Prüfergebnis:

Test result:

Siehe Seite 2-4

Please refer to page 2-4

geprüft/ tested by:

kontrolliert/ checked by:




13 May 2008 Kennie Wong/ Project Chemist

13 May 2008 San Ho/ Project Manager

Datum

Name/Stellung

Unterschrift

Datum

Name/Stellung

Unterschrift

Date

Name/Position

Signature

Date

Name/Position

Signature

Sonstiges/ Other Aspects:

According to the customer's instruction, only component was tested. Please refer to the material list on Page 2 for details.

Abkürzungen:

ok / P = entspricht Prüfgrundlage
 fail / F = entspricht nicht Prüfgrundlage
 n.a. / N = nicht anwendbar

Abbreviations:

ok / P = passed
 fail / F = failed
 n.a. / N = not applicable

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.

Prüfbericht - Nr.: 143060043a 001
Test Report No.:

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Page 2 of 4

Test Method: Organic solvent extraction, GC-MS (QMA 36.035.121 HKG)

Testing Period: 02 May 2008 – 09 May 2008

Material list

Item: PD4T/40 · SIZE: 0.2MM x 48" · COLOR: R0210C · 透明
ITEM NO.: T025-08(10)

Material No.	Material	Color	Location
1	plastic(soft)	transparent green	sheet

Test result

	Test No.	1
	Material No.:	1
Parameter	Unit	Result
Acenaphthene	mg/kg	<0.2
Acenaphthylene	mg/kg	<0.2
Anthracene	mg/kg	<0.2
Benzo[a]anthracene	mg/kg	<0.2
Benzo[a]pyrene(BaP)	mg/kg	<0.2
Benzo[b]fluoranthene	mg/kg	<0.2
Benzo[k]fluoranthene	mg/kg	<0.2
Benzo[g,h,i]perylene	mg/kg	<0.2
Chrysene	mg/kg	<0.2
Dibenzo[a,h]anthracene	mg/kg	<0.2
Fluoranthene	mg/kg	<0.2
Fluorene	mg/kg	<0.2
Indeno[1,2,3-cd]pyrene	mg/kg	<0.2
Naphthalene	mg/kg	0.5
Phenanthrene	mg/kg	0.5
Pyrene	mg/kg	<0.2
Sum PAHs(EPA)	mg/kg	1

Abbreviation : < denotes less than

Determination limit of the test method: < 0.2 mg/kg per PAH component

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Test Report No.:

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Remark:

- *1. Single components with an amount of <0.2 mg/kg were not considered by the calculation of the sum. In the case of all 16 PAHs according to EPA were not detected, the result is stated n.d.
- *2. PAH limits requirement from the GS-Mark Approval

Parameter	Category 1	Category 2	Category 3
	Materials in contact with foodstuffs or materials intended to be put the mouth and toys for children aged <36 months	Materials with foreseeable contact with skin for longer than 30 seconds (long-term skin contact) and toys not covered by category 1.	Materials with foreseeable contact for skin up to 30 seconds (short-term skin contact) or without skin contact
Benzo[a]pyrene [mg/kg]	< 0.2	≤1	≤20
Sum 16 PAH (EPA) [mg/kg]	< 0.2	≤10	≤200

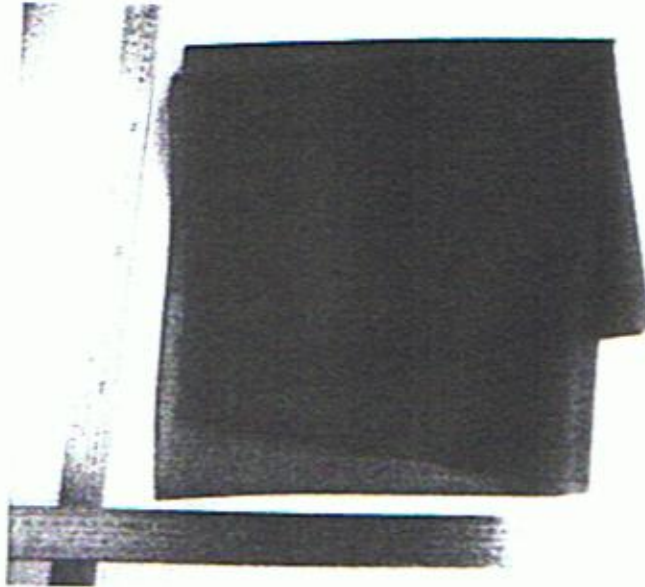
Limit: Specific evaluation required according to type of foreseeable use.

- *3 In the case that the limit of category 1 is exceeded, but fall within the limit of category 2, the proof of suitability for food contact or mucous membrane of the oral cavity contact can be given with an additional specific migration testing of the PAH components according to DIN EN1186ff. and § 64 LFGB 80.30-1(German Food and Feed Code). The results have to be evaluated according to food law principles.

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Test Report No.:

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Sample photo:



- END -