
EVA Ethylene Vinyl Acetate & PEVA

A famous environmental-friendly plastic material

File No.P/P01a-19

31 Oct 2007

There are many restrictions targeting on the use of PVC (Polyvinyl Chloride) because of its toxicity and non-biodegradability. To avoid the risk of non-compliance and prevent environmental pollution, most product developers are now seeking for a new plastic material to replace PVC.

Today, EVA, (Ethylene Vinyl Acetate) is always the best choice to replace PVC because EVA is not expensive comparing with PVC and is an environmental friendly plastic material. Its applications and performance are very similar to PVC while reducing the risk of infringing any toxicity regulations. Therefore, the trend of applying EVA will become majority in most production industries.

What is EVA (Ethylene Vinyl Acetate)?

EVA is a product formed from copolymerization of ethylene (E) with vinyl acetate (VA). The content ratio between ethylene and vinyl acetate can be varied in raw material but not in production site. Higher vinyl acetate content (VA content) offers higher clarity, flexibility and toughness, so different from PVC product, the flexibility of EVA cannot be adjusted by adding different amount of plasticizer.

What is PEVA?

PEVA is a product formed from PE (Polyethylene) and EVA(Ethylene Vinyl Acetate). The ratio between PE and EVA can be adjusted in according to its application. PE is harder and heavier than EVA. Higher PE content provides stronger and tougher PEVA. However, pure PE is not able to be high-frequency welded. Therefore, higher PE content would weaken the ability of high-frequency welding of PEVA.

What are the strengths of EVA & PEVA?

- ✓ **Biodegradable**
No pollution to environment after disposal or incineration
- ✓ **Inexpensive**
The price of EVA and PEVA is very competitive to PVC and other plastic material
- ✓ **Lighter in weight**
With density between 0.91 to 0.93, comparing with PVC's 1.32
- ✓ **Free of smelly odour**
Do not contain any ammonia-like or organic vapour smell
- ✓ **Free of heavy metals**
Complying with toys standard (EN-71 Part 3 and ASTM-F963)
- ✓ **Free of phthalates**
No plasticizer migration and suitable for children product
- ✓ **Good clarity, toughness, flexibility and tear resistance**
High applicability for various products
- ✓ **Excellent resistant to low temperature (-70C)**
Perfect for frozen environment and condition
- ✓ **Good resistance to water, salt and other environment**
Relatively stable under different applications
- ✓ **Good hot tack strength**
Adhere well to nylon, polyester and canvas, etc.
- ✓ **Low sealing temperature**
Higher production cycle
- ✓ **Good Printability**
Available for various decorated products (special ink is needed)

What are the weaknesses of EVA & PEVA?

- × **Weak scratch resistance**
EVA is easier than PVC to be scratched permanently which affecting products appearance
- × **Low melting point**
EVA is not suitable for extreme hot condition (90 °C)
- × **Low tensile strength**
EVA is not suitable for products requiring high tensile strength like inflatable products.

Free of toxic substances:

- ◇ Heavy Metals
- ◇ Phthalates
- ◇ Azo Dyes
- ◇ PCP pentachlorophenol
- ◇ Organotin compounds
- ◇ Formaldehyde
- ◇ PAHs Polycyclic Aromatic Hydrocarbons
- ◇ Nonyl-Phenol
- ◇ SCCP Short-chain chlorinated paraffins, etc.

Compliance with international regulations and directives:

- ✓ EN-71 Part 3 & ASTM –F963a Heavy Metal Requirements
- ✓ EN 1122 Cadmium < 100ppm
- ✓ EN-71 Part 9 Organic chemicals
- ✓ Non-phthalate directive (European Commission) 2005/84/EC)
- ✓ Foodgrade (European Commission 2002/72/EC) or FDA regulation
- ✓ RoHS and WEEE
- ✓ EN-71 Part 2 Flammability Test (Optional), etc.

EVA Film Application Areas, such as:

- **Children products:** Flexible Toys, Stationery, Booklets & Baby Dummies and Cares
- **Packaging:** Food package & Toys package
- **Livelihood application:** Liquid and food container, Footwear, Textile, Fashionable Bags & Accessories , Raincoat, Rain Cap, Umbrella
- **Health care:** Gloves & Masks, Disposable Medical Bags, Medical Protection Cover
- **Housewares:** Shower Curtain, Table Cloth(solid color and printed color), Table Cloth Flannel Back, Portable Table Cloth, Table Skirt, Cloth Cover, Trousers Set Cover, Chair Cover, Mattress Cover, Bed Cover, Shoe Cover.



EVA Films Category

We can now offer Transparent or Colour HIGH QUALITY EVA FILM with different hardness and smoothness (Reminder: Unlike PVC, the hardness of EVA cannot be adjusted by adding different amount of plasticizer)

Basic Material	EVA				PEVA						TPEVA	PE
	AII	BII	C	G	A20	A50	A80	B20	B50	B80	E	
Formula Name	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Silk Printing	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
High frequency Welding	★★★★	★★★★★	★★★	★★	★★★	★★	★	★★★★	★★	★	★★★★	NOT OK
Softness	★★★★	★★★★★	★★★	★★	★★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★★
Abrasive resistance	★★★	★★	★★★★	★★★★★	★★★	★★★	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
Rebound ability	★★★★★	★★★★★	★★★★	★★★	★★★★★	★★★★	★★★★	★★★★★	★★★★	★★★★	★★★★	★★★★
Tensile ability	★★★★★	★★★★★	★★★★	★★★★	★★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★
Smoothness treatment availability	E0-E7	E0-E7	E0-E5	E0-E3	E0	E0	E0	E0	E0	E0	E0	E0
Transparency	★★★★★	★★★★★	★★★★★	★★★★	★★★★	★★★	★★★	★★★★	★★★	★★★	★★★	★★★★
Price	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	★★★	★★	★★★★	★★★	★★	★★★	★

★ Above information is only a relative value, not absolute value.

Hand Feeling Level	E0 (Anti-slipping)	E1	E2	E3	E4	E5	E6	E7 (Crystalline Smooth)
Smoothness Level	Low	—————▶						High

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

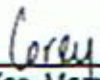
Test Requested : To determine the Soluble Heavy Metal contents in accordance with the European Standard on Safety of Toys, EN 71 Part 3:1994 + A1:2000 – Migration of Certain Elements.

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

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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.

10 Dei Wang Street, Tai Po Industrial Estate, N. T., Hong Kong
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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

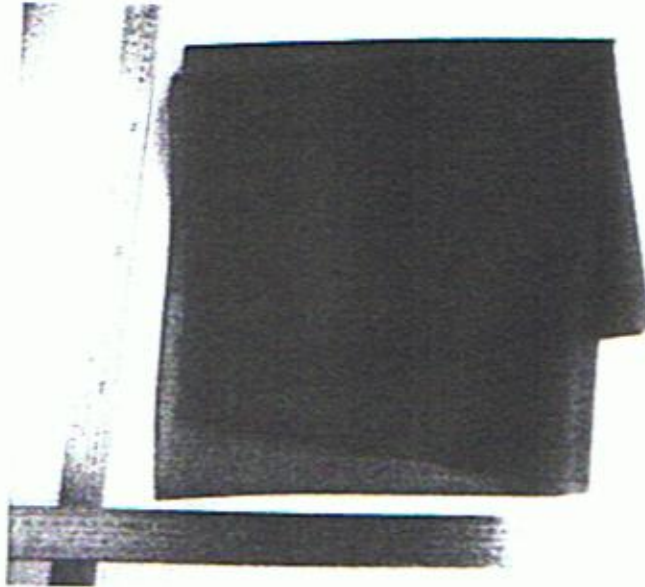
Limit: Specific evaluation required according to type of foreseeable use.

- *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 LFGE 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 -