

SGS INSTITUT FRESENIUS GmbH · Postfach 1261 · 65220 Taunusstein

HANWHA L&C CORPORATION
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Order no.:3247458

Client:10008109

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Consumer Testing Services
 Non Food

SGS INSTITUT FRESENIUS GmbH
 Im Maisel 14
 D-65232 Taunusstein

Taunusstein, February 02, 2015

Your order : Testing of PVC sheets
 Your reference : AYAA15-00282
 Order date : 06/JAN/2015
 Sample no. : 150017711
 Test period : 09/JAN/2015 – 27/JAN/2015

Test report no.: 3247458-01_rev01
Testing according to LFGB

Dear Sirs,

Following your request we have tested the sample received on January 08, 2015 according to the „Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch“ (LFGB) and Regulation (EC) No. 1935/2004 for the requested items.

Sample no.	Sample designation
150017711	PVC sheet

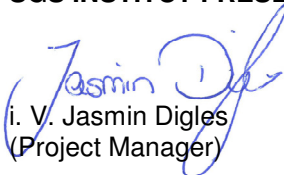
Detailed results are given on the following page(s).

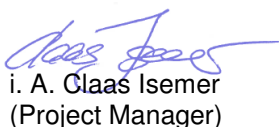
Assessment:

The sample meets the requirements of LFGB and Regulation (EC) No. 1935/2004 in the tested items.

Yours sincerely,

SGS INSTITUT FRESENIUS GmbH


 i. V. Jasmin Digles
 (Project Manager)

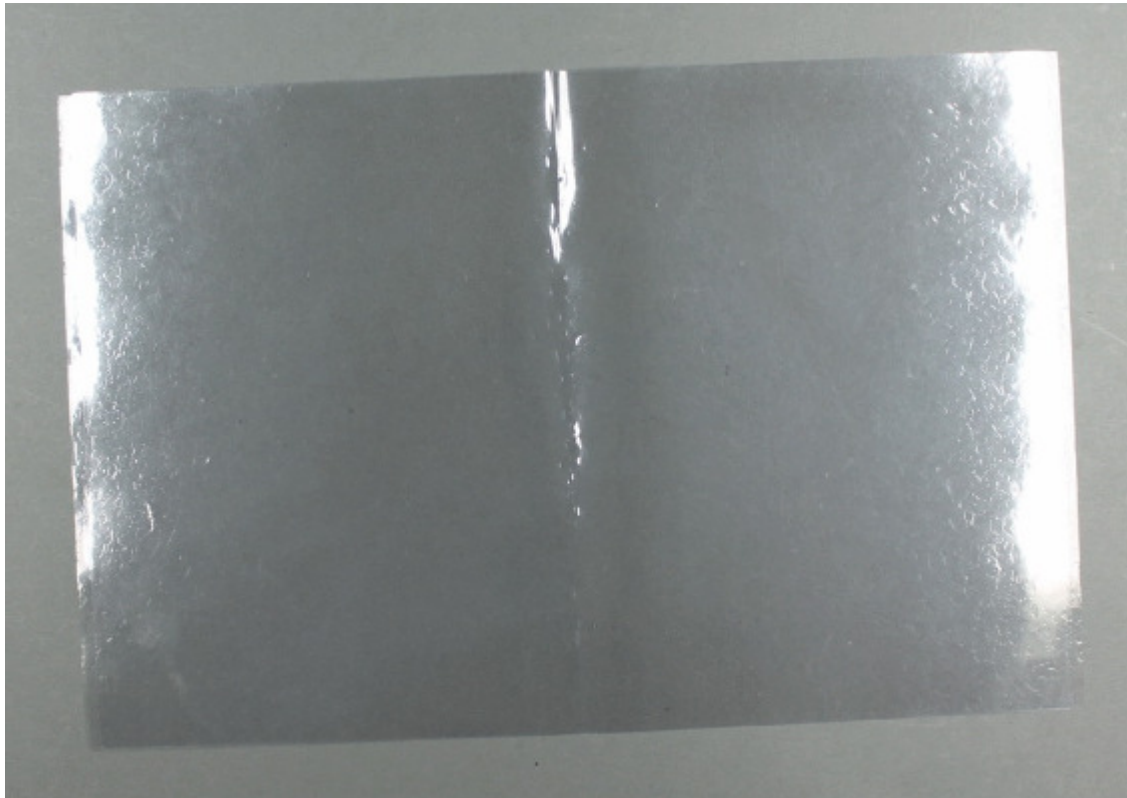

 i. A. Claas Isemer
 (Project Manager)

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Photo documentation:



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Test results:

1. Migration

The sample was brought in contact with the respective simulant and stored. The ratio of surface to volume is 6 dm²/l and the ratio of weight to surface is 4 g/dm² (Tenax)

Water 10 days at 40 °C
 0.2 % acetic acid 10 days at 40 °C
 3 % acetic acid 10 days at 40 °C
 15 % ethanol 10 days at 40 °C
 95 % ethanol 10 days at 40 °C
 Oil 10 days at 40 °C
 Tenax 10 days at 40 °C
 Isooctane 2 days at 20 °C

1.1 Sensory test

The migrates have been sensory tested according to DIN 10955 for off-odour and off-taste in comparison to a blank. This is a similar treated food simulant without sample contact.

Food simulant	Average grade*	
	odour	taste
Water	0	1.0
0.2 % acetic acid	0	0
15 % ethanol	0	0
Oil	0	0

* rounded at 0.5 grades

Key: 0 = no change
 1 = very slight off odour/ off-taste
 2 = slight off-odour / off-taste
 3 = distinct off-odour / off-taste
 4 = strong off-odour / off-taste

With an assessment from 0 to 2.5 there is no, respectively a tolerable organoleptic impact existent in terms of Regulation (EC) No. 1935/2004.

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1.2 Overall migration

The migrates (point 1) have been dried at 105°C and the overall migration was determined as dry residue according to EN 1186.

test liquid	Result [mg/dm ²]	Requirement* [mg/dm ²]
3 % acetic acid	< 1	max. 10
95% ethanol	< 1	max. 10
isooctane	< 1	max. 10

* according to Regulation (EU) No. 10/2011 and amendments

analytical tolerance of the method (§ 64 LFGB B 80.30-3 (EG)):
 2 mg/dm² for aqueous simulants
 3 mg/dm² for olive oil and fat substitutes

1.3 Overall migration for dry food

The migration was carried out according to EN 1186-13. The sample was brought in contact with Tenax for 10 days at 40 °C.

	Result* [mg/dm ²]	Requirement** [mg/dm ²]
Tenax	< 1	max. 10

* Limit of quantification: 1 mg/dm²

** according to Regulation (EU) No. 10/2011 and amendments

1.4 Specific migration of metals

The determination of metals was carried out on the migrate by ICP-OES.

	Results 3 % acetic acid [mg/kg food simulant]	Results 95 % ethanol [mg/kg food simulant]	Requirements* [mg/kg food simulant]
Barium	< 0.01	< 0.01	max. 1
Cobalt	< 0.01	< 0.01	max. 0.05
Copper	< 0.01	< 0.01	max. 5
Iron	< 1	< 1	max. 48
Lithium	< 0.05	< 0.05	max. 0.6
Manganese	< 0.01	< 0.01	max. 0.6
Zinc	< 1	< 1	max. 25

* according to Regulation (EU) No. 10/2011 and amendments

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1.5 Specific migration of plasticizers acc. to Regulation (EU) No. 10/2011

The determination was carried out on the migrate by GC-MS and internal standardization and calibration over the whole procedure.

Compound	Abbrev.	Results 95 % ethanol [mg/kg food simulant]	Requirement* [mg/kg food simulant]
n-Decyl-n-octylphthalate	NDNOP	< 0.05	in Sum max. 5**
Di-n-decylphthalate	DNDP	< 0.05	
Di-n-octylphthalate	DNOP	< 0.05	
Benzylbutylphthalate	BBP	< 0.05	max. 30
Di-(2-ethylhexyl)phthalate	DEHP	< 0.05	max. 1.5
Dibutylphthalate	DBP	< 0.05	max. 0.3
Phthalic acid, diesters with primary saturated C ₈ -C ₁₀ -branched alcohols, more than 60 % C ₉	-	< 0.05	in Sum max. 9
Phthalic acid, diesters with primary saturated C ₉ -C ₁₁ -alcohols more than 90 % C ₁₀	-	< 0.05	
Tributylacetylacrylate	TBAC	< 0.05	max. 60
Dibutylsebacate	DBS	< 0.05	max. 60
Diallylphthalate	DiAIP	< 0.01	max. 0.01
Diethylhexyladipate	DEHA	< 0.05	max. 30
Di-(2-ethylhexyl)terephthalate	DEHT	< 0.05	max. 60
Diisononyl-cyclohexyldicarboxylate	DINCH	< 0.05	max. 60

Limit of quantification per substance: 0.05 mg/kg food simulant and 0.01 mg/kg (DiAIP).

* according to Regulation (EU) No. 10/2011 (migratable phthalates)

** according directive 2007/19/EC

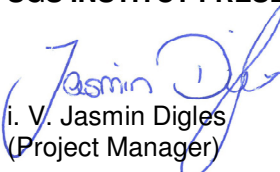
1.6 Specific migration of vinylchloride

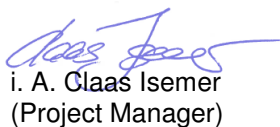
The determination was carried out on the migrate by Headspace-GC-MS.

	Results [mg/kg food simulant]	Requirement* [mg/kg food simulant]
95 % ethanol	not detectable	not detectable (< 0.01)

* according to Regulation (EU) No. 10/2011 and amendments

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 (Project Manager)


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