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報告號碼: KY/2019/80385

建築材料試驗報告

(建材中甲醛、TVOC逸散測試-環控箱法)

委託單位: 約恩嗶聯合有限公司 檢驗單位: 台灣檢驗科技股份有限公司高雄分公司

執行日期: 2019/08/26 報告編號: KY/2019/80385

報告日期: 2019/09/03





化學實驗室一高雄



建築材料試驗報告

報告編號:

KY/2019/80385

日期: 2019年09月03日

公司名稱:

約恩嗶聯合有限公司

公司地址:

台南市麻豆區麻口里33-8號

以下測試之樣品係由供應廠商所提供及確認

KRONOFLOORING(Krono Original) 酷龍德國精工木地板

產品名稱: 產品型號:

KRO-8mm(厚度8mm, 4層, F3)

产品成份:

松木樹、(地板花色)紙、樹脂(黏著劑)

產品用途:

地板或地面

產品厚度:

8mm

送樣日期:

2019年8月26日

試驗日期:

2019年8月26日

委託單位:

約恩嗶聯合有限公司

統一編號:

97293397

委託單位負責人:

徐貴壕

委託單位地址:

台南市麻豆區麻口里33-8號

負責人身份證號:

備註:

R120657911

1. 以上資料由顧客提供。2. 本樣品由SGS材料暨工程實驗室-台中(申請書編號:TB-19-04225 C-19-10335)轉送至 本實驗室執行本報告所示之試驗項目。

台灣檢驗科技股份有限公司高雄分公司

試驗單位: 試驗單位負責人:

曾偉明

委託測試項目:

甲醛、TVOC

測試方法:

TVOC:本測試依據ASTM D5116及內政部建築研究所,"室內建材揮發性有機逸散物質檢測標準試驗

方法及程序之研究",計畫編號: MOIS901014

甲醛:本測試依據ISO 16000-3及ISO 16000-9方法檢測。

測試結果:

測試項目	測試結果 (mg/m²*hr)		'A #4 / AT	性能水準(逸散速率 mg/m²*hr)		
TVOC	0.005	26	逸散分級	TVOC	甲醛	
1700	0.003.	20	E1	≤ 0.005	≤ 0.005	
甲醛	0.047	0470 E2		0.005 <tvoc≦0.06< td=""><td>0.005<甲醛≦0.02</td></tvoc≦0.06<>	0.005<甲醛≦0.02	
GE	0.047	70	E3	0.06 <tv0c≤0.19< td=""><td>0.02<甲醛≦0.05</td></tv0c≤0.19<>	0.02<甲醛≦0.05	
	「健康綠建材標			逸散等級判定		
甲醛选散分级	TVOC 逸散分级	I	E1	E2	E3	
E1	E1 E		∃1	E2	E3	
E2	E2 E		Ξ2	E2	E3	
E3		H	E3	E3	E3	

TVOC MDL: 0.005mg/m²*hr 甲醛MDL:0.005mg/m2*hr



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一、測試目的:

利用小型環控箱模擬室內環境條件,將欽測試的建材放入,建材中之揮發性有機物質(Volatile Organic Compounds,VOCs)及甲醛會 於環控箱中慢慢逸散至穩定狀態,再以適當之吸附管予以定流量捕集濃縮,經適當之脫附及萃取方式將待測物脫附後注入氣相層析質 譜儀 (GC/MS) 及液相層析儀/二極體陣列儀 (HPLC/DAD) ,分別進行揮發性有機物質及甲醛的定量分析。此方法用於建材中揮發 性有機物質及甲醛之逸散評估。

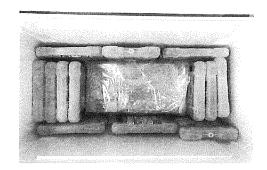
二、採樣與保存:

1、採樣前準備:

採樣所使用之採樣袋、潔淨鋁箔、採樣箱內部等,於採樣前以去除水分之高純度氮氣沖洗及置換,清洗完成後密閉並放置於潔淨處。

2、建材樣品收集:

乾式建材以潔淨鋁箔包覆置入採樣袋中,切割尺寸為200mm×360mm,收集後放置於4℃下之採樣箱中予以保存;溼式建材則在未開啟 狀態置入4℃下之採樣箱中予以保存,均於兩日內進行分析。本次測試樣品運送及保存如下:





3、建材樣品保存及運送:

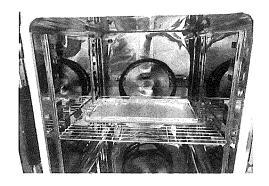
建材樣品收集於採樣箱中保存,溫度控制於4℃下進行運送,過程不得開啟避免碰撞,直到環控箱中的空白實驗完成後方得以開啟, 開啟過程應於環控箱中進行,溼式建材應於排煙櫃中開啟,並於環控箱中進行塗刷製作受測樣品。

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測試樣品照片





4 · GC/MS Tune:

在分析樣品前須先以GC/MS內建之FC-43 (PFTBA, Perfluoro Tributyl Amine)校正GC/MS,所得分析結果必須符合下表的要求。校正 結果如下表所示。

M/Z	Ion Abundance	Ion Abundance Criteria
69	100	
219	92.6	40-150% of mass 69
502	6.59	4-14% of mass 69

5、環控箱空白實驗:

單一揮發性有機物質的濃度需小於0.31µg/m³,而總揮發性有機物質(TVOC)濃度則不可超過4µg/m³。甲醛的濃度需小於2µg/m³。

測試結果:

	測試濃度	偵測極限	規範濃度	
項目	$(\mu g/m^3)$	$(\mu g/m^3)$	(μg/m ³)	測試結果
苯	n.d.	0.03	0.31	PASS
甲苯	n.d.	0.16	0.31	PASS
乙苯	n.d.	0.09	0.31	PASS
鄭-二甲苯	n.d.	0.13	0.31	PASS
間,對-二甲苯	n.d.	0.20	0.62	PASS
二氯甲烷	n.d.	0.09	0.31	PASS
三氟甲烷	n.d.	0.05	0.31	PASS
四氟化碳	n.d.	0.09	0.31	PASS
三氟乙烯	n.d.	0.09	0.31	PASS
四氯乙烯	n.d.	0.10	0.31	PASS
苯乙烯	n.d.	0.06	0.31	PASS
1,2-二氯苯	n.d.	0.09	0.31	PASS
1,4-二氯苯	n.d.	0.14	0.31	PASS
TVOC	n.d.	-	4	PASS
甲醛	n.d.	0.18	2	PASS

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三、測試條件及採樣頻率:

- 1、設定環境控制箱之環境條件:環控箱尺寸:0.18 m³,溫度:25℃,溼度:50%, 换氧率: 0.5 hr-1。
- 2、測試樣品尺寸為 200 mmx360 mmx1件,單面逸散測試,負荷率:0.4。
- 3、取樣時間48 hr。
- 4、採樣時間及頻率分別如下:

揮發性有機物(VOCs):

實驗開始進行24小時內,以每分鐘50 mL/min,採樣頻率為每一小時採樣一次,每次採樣時間為 一小時;實驗進行24小時後,採樣時間改以每二小時採樣一次,每次採樣時間為二小時。

甲醛:

實驗開始進行24小時內,以每分鐘100 mL/min,採樣頻率為每二小時採樣一次,每次採樣時間為 二小時;實驗進行24小時後,採樣時間改以每四小時採樣一次,每次採樣時間為四小時。

四、結果處理:

揮發性有機物(VOCs)

以GC/MS進行定量分析:

定量分析方法乃利用有機物質之面積對應檢量線,可求得特定時間點有機物質總量,並配合採樣 體積即可求出建材中有機物質逸散濃度變化情形。

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TWG7022852





揭繇性有幽恸韵掳毒:

採樣點	採樣時間	苯	甲苯	乙苯	間,對-二甲苯	鄭-二甲:
141820	1本4永町1町	(μg/m³)	(μg/m³)	(μg/m ³)	(μg/m³)	(μg/m³
1	第0-1小時	0.541	35.8	1.27	2.91	1.37
2	第1-2小時	0.340	21.0	1.02	2.52	1.17
3	第2-3小時	0.252	8.74	0.777	1.93	0.941
4	第3-4小時	0.243	6.21	0.715	1.78	0.879
_ 5	第4-5小時	n.d.	4.94	0.668	1.67	0.845
6	第5-6小時	n.d.	4.48	0.650	1.61	0.823
7	第6-7小時	n.d.	4.03	0.619	1.52	0.768
8	第7-8小時	n.d.	3.76	0.596	1.44	0.733
9	第8-9小時	n.d.	3.60	0.585	1.41	0.727
10	第9-10小時	n.d.	3.47	0.576	1.37	0.707
11	第10-11小時	n.d.	3.34	0.562	1.32	0.685
12	第11-12小時	n.d.	3.25	0.558	1.30	0.674
13	第12-13小時	n.d.	3.08	0.547	1.26	0.664
14	第13-14小時	n.d.	3.00	0.538	1.23	0.648
15	第14-15小時	n.d.	2.95	0.536	1.23	0.661
16	第15-16小時	n.d.	2.85	0.529	1.19	0.640
17	第16-17小時	n.d.	2.73	0.524	1.17	0.636
18	第17-18小時	n.d.	2.66	0.512	1.17	0.630
19	第18-19小時	n.d.	2.64	0.507	1.16	0.629
20	第19-20小時	n.d.	2.52	0.506	1.16	0.626
21	第20-21小時	n.d.	2.42	0.505	1.14	0.623
22	第21-22小時	n.d.	2.41	0.499	1.10	0.617
23	第22-23小時	n.d.	2.31	0.496	1.08	0.608
24	第23-24小時	n.d.	2.04	0.478	1.04	0.599
25	第24-26小時	n.d.	2.00	0.463	1.00	0.575
26	第26-28小時	n.d.	2.09	0.420	1.03	0.571
27	第28-30小時	n.d.	2.08	0.392	1.01	0.562
28	第30-32小時	n.d.	2.04	0.370	0.935	0.539
29	第32-34小時	n.d.	1.92	0.362	0.887	0.504
30	第34-36小時	n.d.	1.91	0.358	0.863	0.516
31	第36-38小時	n.d.	1.85	0.356	0.833	0.513
32	第38-40小時	n.d.	1.81	0.353	0.827	0.508
33	第40-42小時	n.d.	1.76	0.352	0.809	0.499
34	第42-44小時	n.d.	1.68	0.344	0.789	0.486
35	第44-46小時	n.d.	1.66	0.341	0.741	0.470
36	第46-48小時	n.d.	1.35	0.338	0.717	0.436





揮發性有機物數據表:

採樣點	採樣時間	二氯甲烷	三氯甲烷	四氯化碳	三氯乙烯	四氯乙炔
PIC INC.	1/10/1/2 - 1/10/	(μg/m³)	(μg/m ³)	(μg/m³)	(μg/m ³)	(μg/m ³)
1	第0-1小時	60.3	0.897	n.d.	0.858	n.d.
2	第1-2小時	25.7	0.703	n.d.	0.589	n.d.
3	第2-3小時	6.41	n.d.	n.d.	0.346	n.d.
4	第3-4小時	5.19	n.d.	n.d.	0.310	n.d.
5	第4-5小時	4.36	n.d.	n.d.	n.d.	n.d.
6	第5-6小時	4.00	n.d.	n.d.	n.d.	n.d.
7	第6-7小時	3.69	n.d.	n.d.	n.d.	n.d.
8	第7-8小時	3.65	n.d.	n.d.	n.d.	n.d.
9	第8-9小時	3.39	n.d.	n.d.	n.d.	n.d.
10	第9-10小時	3.19	n.d.	n.d.	n.d.	n.d.
11	第10-11小時	2.97	n.d.	n.d.	n.d.	n.d.
12	第11-12小時	2.75	n.d.	n.d.	n.d.	n.d.
13	第12-13小時	2.69	n.d.	n.d.	n.d.	n.d.
14	第13-14小時	2.58	n.d.	n.d.	n.d.	n.d.
15	第14-15小時	2.49	n.d.	n.d.	n.d.	n.d.
16	第15-16小時	2.41	n.d.	n.d.	n.d.	n.d.
17	第16-17小時	2.20	n.d.	n.d.	n.d.	n.d.
18	第17-18小時	2.11	n.d.	n.d.	n.d.	n.d.
19	第18-19小時	2.11	n.d.	n.d.	n.d.	n.d.
20	第19-20小時	2.02	n.d.	n.d.	n.d.	n.d.
21	第20-21小時	1.96	n.d.	n.d.	n.d.	n.d.
22	第21-22小時	1.94	n.d.	n.d.	n.d.	n.d.
23	第22-23小時	1.93	n.d.	n.d.	n.d.	n.d.
24	第23-24小時	1.87	n.d.	n.d.	n.d.	n.d.
25	第24-26小時	1.83	n.d.	n.d.	n.d.	n.d.
26	第26-28小時	1.74	n.d.	n.d.	n.d.	n.d.
27	第28-30小時	1.55	n.d.	n.d.	n.d.	n.d.
28	第30-32小時	1.48	n.d.	n.d.	n.d.	n.d.
29	第32-34小時	1.40	n.d.	n.d.	n.d.	n.d.
30	第34-36小時	1.37	n.d.	n.d.	n.d.	n.d.
31	第36-38小時	1.35	n.d.	n.d.	n.d.	n.d.
32	第38-40小時	1.34	n.d.	n.d.	n.d.	n.d.
33	第40-42小時	1.26	n.d.	n.d.	n.d.	n.d.
34	第42-44小時	1.22	n.d.	n.d.	n.d.	n.d.
35	第44-46小時	1.17	n.d.	n.d.	n.d.	n.d.
36	第46-48小時	1.12	n.d.	n.d.	n.d.	n.d.

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揮發性有機物數據表:		報告號碼 : KY/2019/80385					
採樣點	7.≎ 1≰ 0∓ 88	苯乙烯	1,2-二氯苯	1,4-二氟苯	TVOC	逸散率	
1本1水池	採樣時間	(μg/m ³)	$(\mu g/m^3)$	$(\mu g/m^3)$	$(\mu g/m^3)$	$(mg/m^2 \cdot hr)$	
1	第0-1小時	1.01	n.d.	n.d.	105	0.131	
2	第1-2小時	0.775	n.d.	n.d.	53.8	0.0672	
3	第2-3小時	0.522	n.d.	n.d.	19.9	0.0249	
4	第3-4小時	0.458	n.d.	n.d.	15.8	0.0197	
5	第4-5小時	0.433	n.d.	n.d.	12.9	0.0162	
6	第5-6小時	0.409	n.d.	n.d.	12.0	0.0150	
7	第6-7小時	0.375	n.d.	n.d.	11.0	0.0138	
8	第7-8小時	0.377	n.d.	n.d.	10.6	0.0132	
9	第8-9小時	0.367	n.d.	n.d.	10.1	0.0126	
10	第9-10小時	0.360	n.d.	n.d.	9.67	0.0121	
11	第10-11小時	0.352	n.d.	n.d.	9.23	0.0115	
12	第11-12小時	0.350	n.d.	n.d.	8.87	0.0111	
13	第12-13小時	0.345	n.d.	n.d.	8.59	0.0107	
14	第13-14小時	0.344	n.d.	n.d.	8.34	0.0104	
15	第14-15小時	0.337	n.d.	n.d.	8.21	0.0103	
16	第15-16小時	0.333	n.d.	n.d.	7.95	0.00994	
17	第16-17小時	0.328	n.d.	n.d.	7.59	0.00949	
18	第17-18小時	0.326	n.d.	n.d.	7.40	0.00925	
19	第18-19小時	0.325	n.d.	n.d.	7.37	0.00921	
20	第19-20小時	0.321	n.d.	n.d.	7.15	0.00894	
21	第20-21小時	0.317	n.d.	n.d.	6.96	0.00871	
22	第21-22小時	0.316	n.d.	n.d.	6.87	0.00859	
23	第22-23小時	0.310	n.d.	n.d.	6.73	0.00841	
24	第23-24小時	0.307	n.d.	n.d.	6.33	0.00791	
25	第24-26小時	0.300	n.d.	n.d.	6.18	0.00772	
26	第26-28小時	0.297	n.d.	n.d.	6.14	0.00768	
27	第28-30小時	0.291	n.d.	n.d.	5.88	0.00734	
28	第30-32小時	0.283	n.d.	n.d.	5.65	0.00706	
29	第32-34小時	0.274	n.d.	n.d.	5.35	0.00668	
30	第34-36小時	0.271	n.d.	n.d.	5.29	0.00661	
31	第36-38小時	0.267	n.d.	n.d.	5.17	0.00646	
32	第38-40小時	0.265	n.d.	n.d.	5.11	0.00639	
33	第40-42小時	0.255	n.d.	n.d.	4.93	0.00616	
34	第42-44小時	0.252	n.d.	n.d.	4.77	0.00596	
35	第44-46小時	0.248	n.d.	n.d.	4.64	0.00580	
36	第46-48小時	0.242	n.d.	n.d.	4.21	0.00526	

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TWC7022849





甲醛數據表:

下瞪驳像衣。			
採樣點	採樣時間	甲醛	逸散率
74.74.70	沐 禄时间	(μg/m³)	(mg/ m² ⋅ hr)
1	第0-2小時	43.4	0.0542
2	第2-4小時	43.3	0.0541
3	第4-6小時	43.2	0.0540
4	第6-8小時	43.2	0.0540
5	第8-10小時	43.1	0.0538
6	第10-12小時	42.9	0.0537
7	第12-14小時	42.9	0.0536
8	第14-16小時	42.8	0.0535
9	第16-18小時	42.7	0.0534
10	第18-20小時	42.6	0.0533
11	第20-22小時	42.6	0.0532
12	第22-24小時	42.4	0.0531
13	第24-28小時	42.3	0.0529
14	第28-32小時	41.7	0.0522
15	第32-36小時	40.4	0.0504
16	第36-40小時	39.3	0.0491
17	第40-44小時	38.5	0.0481
18	第44-48小時	37.6	0.0470





五、逸散率圖:

Figl. 建材中總揮發性有機物逸散率

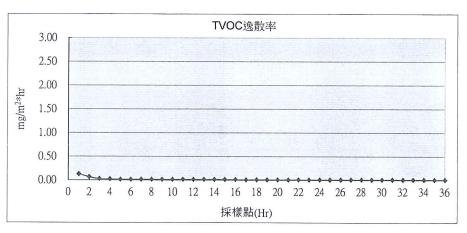
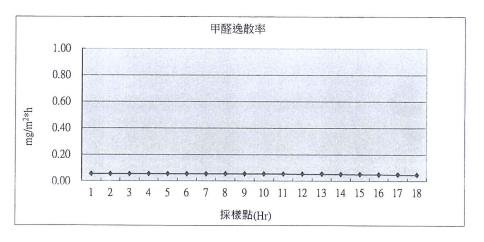


Fig2. 建材中甲醛逸散率



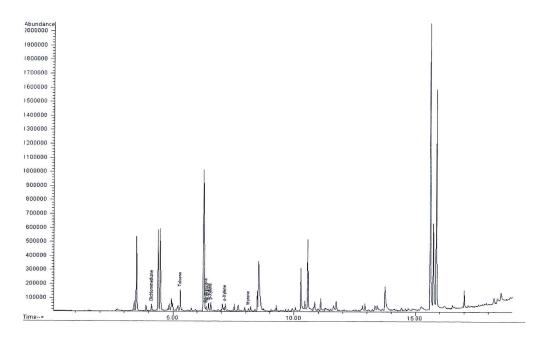
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TWC7022847





六、46~48hr TVOC分析圖譜:



滯留時間(min)	COMPONENT(S)	
5.468	Dichloromethane	
6.605	Trichloromethane	
5.158	Carbon tetrachloride	
5.637	Benzene	
6.108	Trichloroethylene	
6.726	Toluene	
6.486	Tetrachloroethylene	
7.743	Ethylbenzene	
7.84	m-xylene	
7.932	p-xylene	
8.545	o-xylene	
9.618		
12.255	1.2-dichlorobenzene	
12.858 1.4-dichlorobenzene		

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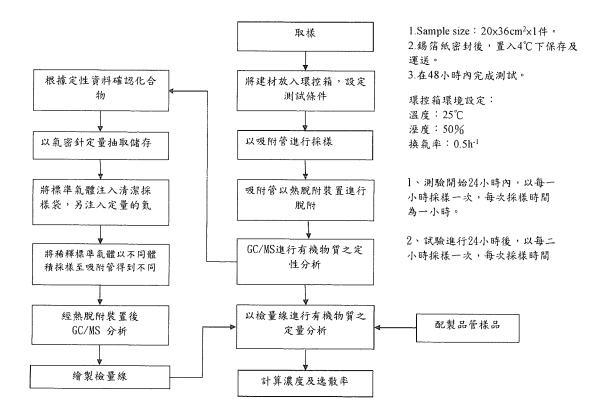
WC7022846

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報告號碼: KY/2019/80385

セ、VOCs採樣及分析流程:

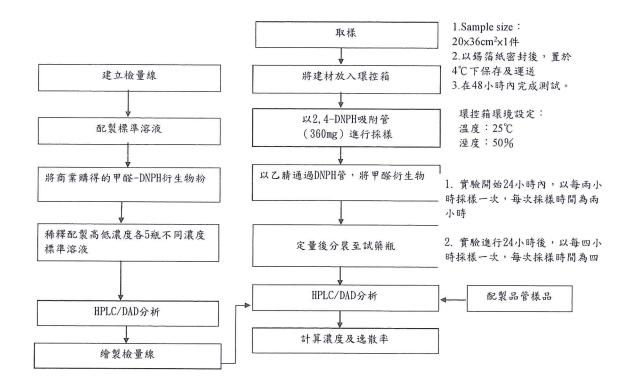


頁數: 13 of 13



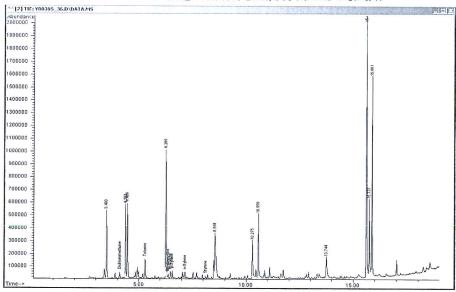
報告號碼: KY/2019/80385

八、甲醛採樣及分析流程:



*** END OF REPORT ***

附件: KY/2019/80385 46-48hr_TVOC分析圖譜及成分尖峰(Peak)之定性資料



滯留時間(min)	COMPONENT(S)				
3.49	Cyclotrisiloxane, hexamethyl-				
4.38	Heptane, 2,2,4,6,6-pentamethyl-				
4.47	Cyclotetrasiloxane, octamethyl-				
6.29	Cyclopentasiloxane, decamethyl-				
8.54	Cyclohexasiloxane, dodecamethyl-				
10.28	N,N-Dimethylacetamide				
10.56	Acetic acid				
13.74	2-Pyrrolidinone, 1-methyl-				
15.60	Propanoic acid, 2-methyl-, 3-hydroxy-2,2,4-trimethylpentyl ester				
15.74	Benzyl alcohol				
15.86	Butanoic acid butyl ester				