

Test Report

號碼(No.): ETR23400889M02 日期(Date): 13-Apr-2023 頁數(Page): 1 of 17

昇貿科技股份有限公司 (SHENMAO TECHNOLOGY INC.)

桃園市觀音區大潭里大潭北路665號 (NO. 665, DATAN N. RD., GUANYIN DIST., TAOYUAN CITY 328, TAIWAN)

以下測試樣品係由申請廠商所提供及確認 (The following sample(s) was/were submitted and identified by the applicant as):

樣品名稱(Sample Name) : LEAD-FREE BGA SPHERE

樣品型號(Style/Item No.) : PF683-S(98.5Sn/1.0Ag/0.5Cu/0.03Ni)

收件日(Sample Receiving Date)

07-Apr-2023

測試期間(Testing Period)

: 07-Apr-2023 to 13-Apr-2023

測試需求(Test Requested)

(1) 依據客戶指定、參考RoHS 2011/65/EU Annex II及其修訂指令(EU) 2015/863測 試鎘、鉛、汞、六價鉻、多溴聯苯、多溴聯苯醚, DBP, BBP, DEHP, DIBP。 (As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted

sample(s).)

(2) 其他測試項目請見下一頁。 (Please refer to next pages for the other item(s).)

測試結果(Test Results)

請參閱下一頁 (Please refer to following pages.)

Troy Chang / Department Malager
Signed for and on behalf of AIWAN LTD.
Chemical Laboratory - Taipei



PIN CODE: EF97B1F4



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測試部位敘述 (Test Part Description)

No.1 : 銀色金屬球 (SILVER COLORED METAL BALL)

測試結果 (Test Results)

測試項目 (Test Items)	測試方法 (Method)	單位 (Unit)	MDL	結果 (Result)
鎘 (Cd) (Cadmium (Cd))	參考IEC 62321-5: 2013·以感應耦合電漿發射光 譜儀分析。(With reference to IEC 62321-5: 2013, analysis was performed by ICP-OES.)	mg/kg	2	No.1 n.d.
鉛 (Pb) (Lead (Pb))		mg/kg	2	26.8
汞 (Hg) (Mercury (Hg))	參考IEC 62321-4: 2013+ AMD1: 2017‧以感應耦合電漿發射光譜儀分析。(With reference to IEC 62321-4: 2013+ AMD1: 2017, analysis was performed by ICP-OES.)	mg/kg	2	n.d.
六價鉻 (Hexavalent Chromium) Cr(VI) (#2)	參考IEC 62321-7-1: 2015 · 以紫外光-可見光分光 光度計分析。(With reference to IEC 62321-7-1: 2015, analysis was performed by UV-VIS.)	μg/cm²	0.1	n.d.
一溴聯苯 (Monobromobiphenyl)		mg/kg	5	n.d.
二溴聯苯 (Dibromobiphenyl)		mg/kg	5	n.d.
三溴聯苯 (Tribromobiphenyl)		mg/kg	5	n.d.
四溴聯苯 (Tetrabromobiphenyl)		mg/kg	5	n.d.
五溴聯苯 (Pentabromobiphenyl)	參考IEC 62321-6: 2015,以氣相層析儀/質譜儀分	mg/kg	5	n.d.
六溴聯苯 (Hexabromobiphenyl)	析。(With reference to IEC 62321-6: 2015,	mg/kg	5	n.d.
七溴聯苯 (Heptabromobiphenyl)	analysis was performed by GC/MS.)	mg/kg	5	n.d.
八溴聯苯 (Octabromobiphenyl)	1	mg/kg	5	n.d.
九溴聯苯 (Nonabromobiphenyl)	1	mg/kg	5	n.d.
十溴聯苯 (Decabromobiphenyl)	1	mg/kg	5	n.d.
多溴聯苯總和 (Sum of PBBs)]	mg/kg	-	n.d.



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測試項目	測試方法	單位	MDL	結果
(Test Items)	(Method)	(Unit)		(Result)
				No.1
一溴聯苯醚 (Monobromodiphenyl ether)		mg/kg	5	n.d.
二溴聯苯醚 (Dibromodiphenyl ether)		mg/kg	5	n.d.
三溴聯苯醚 (Tribromodiphenyl ether)		mg/kg	5	n.d.
四溴聯苯醚 (Tetrabromodiphenyl ether)		mg/kg	5	n.d.
五溴聯苯醚 (Pentabromodiphenyl ether)	参考IEC 62321-6: 2015,以氣相層析儀/質譜儀分	mg/kg	5	n.d.
六溴聯苯醚 (Hexabromodiphenyl ether)	析。(With reference to IEC 62321-6: 2015,	mg/kg	5	n.d.
七溴聯苯醚 (Heptabromodiphenyl ether)	analysis was performed by GC/MS.)	mg/kg	5	n.d.
八溴聯苯醚 (Octabromodiphenyl ether)		mg/kg	5	n.d.
九溴聯苯醚 (Nonabromodiphenyl ether)		mg/kg	5	n.d.
十溴聯苯醚 (Decabromodiphenyl ether)		mg/kg	5	n.d.
多溴聯苯醚總和 (Sum of PBDEs)		mg/kg	-	n.d.
鄰苯二甲酸丁苯甲酯 (BBP) (Butyl benzyl	參考IEC 62321-8: 2017 · 以氣相層析儀/質譜儀分	mg/kg	50	n.d.
phthalate (BBP))	析。(With reference to IEC 62321-8: 2017,			
	analysis was performed by GC/MS.)			
鄰苯二甲酸二丁酯 (DBP) (Dibutyl	參考IEC 62321-8: 2017,以氣相層析儀/質譜儀分	mg/kg	50	n.d.
phthalate (DBP))	析。(With reference to IEC 62321-8: 2017,			
	analysis was performed by GC/MS.)			
鄰苯二甲酸二(2-乙基己基)酯 (DEHP) (Di-	參考IEC 62321-8: 2017,以氣相層析儀/質譜儀分	mg/kg	50	n.d.
(2-ethylhexyl) phthalate (DEHP))	析。(With reference to IEC 62321-8: 2017,			
	analysis was performed by GC/MS.)			
鄰苯二甲酸二異丁酯 (DIBP) (Diisobutyl	參考IEC 62321-8: 2017 · 以氣相層析儀/質譜儀分	mg/kg	50	n.d.
phthalate (DIBP))	析。(With reference to IEC 62321-8: 2017,	J. J		
	analysis was performed by GC/MS.)			
鄰苯二甲酸二異癸酯 (DIDP) (Diisodecyl	參考IEC 62321-8: 2017 · 以氣相層析儀/質譜儀分	mg/kg	50	n.d.
phthalate (DIDP)) (CAS No.: 26761-40-	析。(With reference to IEC 62321-8: 2017,	<i>J, J</i>		
0, 68515-49-1)	analysis was performed by GC/MS.)			
鄰苯二甲酸二異壬酯 (DINP) (Diisononyl	参考IEC 62321-8: 2017 · 以氣相層析儀/質譜儀分	mg/kg	50	n.d.
phthalate (DINP)) (CAS No.: 28553-12-	析。(With reference to IEC 62321-8: 2017,] 3, 3		
0, 68515-48-0)	analysis was performed by GC/MS.)			
娜苯二甲酸二正辛酯 (DNOP) (Di-n-octyl	参考IEC 62321-8: 2017·以氣相層析儀/質譜儀分	mg/kg	50	n.d.
phthalate (DNOP)) (CAS No.: 117-84-0)	析。(With reference to IEC 62321-8: 2017,	<i>3,</i> 9	- -	
	analysis was performed by GC/MS.)			
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測試項目	測試方法	單位	MDL	結果
(Test Items)	(Method)	(Unit)		(Result)
				No.1
六溴環十二烷及所有主要被辨別出的異構物	參考IEC 62321: 2008 · 以氣相層析儀/質譜儀分	mg/kg	5	n.d.
(HBCDD) (α - HBCDD, β - HBCDD, γ - HBCDD) (Hexabromocyclododecane (HBCDD) and	析。(With reference to IEC 62321: 2008, analysis			
all major diastereoisomers identified (α-	was performed by GC/MS.)			
HBCDD, β- HBCDD, γ- HBCDD)) (CAS No.:				
25637-99-4, 3194-55-6 (134237-51-7,				
134237-50-6, 134237-52-8))				
氯 (Cl) (Chlorine (Cl)) (CAS No.: 22537-	參考BS EN 14582: 2016,以離子層析儀分析。	mg/kg	50	n.d.
15-1)	(With reference to BS EN 14582: 2016, analysis			
	was performed by IC.)			
溴 (Br) (Bromine (Br)) (CAS No.: 10097-	參考BS EN 14582: 2016 · 以離子層析儀分析。	mg/kg	50	n.d.
32-2)	(With reference to BS EN 14582: 2016, analysis			
	was performed by IC.)			
全氟辛烷磺酸及其鹽類 (PFOS and its	參考CEN/TS 15968: 2010 · 以液相層析串聯質譜	mg/kg	0.01	n.d.
salts) (CAS No.: 1763-23-1 and its salts)	儀分析。(With reference to CEN/TS 15968:			
	2010, analysis was performed by LC/MS/MS.)			
全氟辛酸及其鹽類 (PFOA and its salts)	參考CEN/TS 15968: 2010 · 以液相層析串聯質譜	mg/kg	0.01	n.d.
(CAS No.: 335-67-1 and its salts)	儀分析。(With reference to CEN/TS 15968:			
	2010, analysis was performed by LC/MS/MS.)		0.5	
多氯聯苯 (PCBs) (Polychlorinated	参考US EPA 3550C: 2007・以氣相層析儀/質譜儀	mg/kg	0.5	n.d.
biphenyls (PCBs))	分析。(With reference to US EPA 3550C: 2007, analysis was performed by GC/MS.)			
夕气大 (DCNIa) (Dalvahla vinata d	参考US EPA 3550C: 2007 · 以氣相層析儀/質譜儀	100 or /l cor	-	10 d
多氯奈 (PCNs) (Polychlorinated naphthalene (PCNs))	多名US EPA 3550C: 2007,以照伯層析儀/員譜儀 分析。(With reference to US EPA 3550C: 2007,	mg/kg	5	n.d.
napritrialerie (PCNS))	analysis was performed by GC/MS.)			
多氯三聯苯 (PCTs) (Polychlorinated	参考US EPA 3550C: 2007 · 以氣相層析儀/質譜儀	mg/kg	0.5	n.d.
支銀二哪本 (PCTs) (Polychiofinated terphenyls (PCTs))	今句3 EPA 3530C. 2007・以来伯層が展/真盲展 分析。(With reference to US EPA 3550C: 2007,	mg/kg	0.5	n.a.
terprierry (i e r s))	analysis was performed by GC/MS.)			
 短鏈氯化石蠟(C10-C13) (SCCP) (Short	参考ISO 18219-1: 2021 · 以氣相層析儀/質譜儀分	mg/kg	50	n.d.
Chain Chlorinated Paraffins(C10-C13)	析。(With reference to ISO 18219-1: 2021,	mg/kg	30	n.u.
(SCCP)) (CAS No.: 85535-84-8)	analysis was performed by GC/MS.)			
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測試項目 (Test Items)	測試方法 (Method)	單位 (Unit)	MDL	結果 (Result) No.1
三丁基錫 (TBT) (Tributyl tin (TBT))	參考ISO 17353: 2004·以氣相層析儀/火焰光度偵測器分析。(With reference to ISO 17353: 2004, analysis was performed by GC/FPD.)	mg/kg	0.03	n.d.
氧化雙三丁基錫 (TBTO) (Bis(tributyltin) oxide (TBTO)) (CAS No.: 56-35-9)	由三丁基錫測試結果計算得之。(Calculated from the result of Tributyl Tin (TBT).)	mg/kg	0.03 🛦	n.d.
三苯基錫 (TPT) (Triphenyl tin (TPT))	參考ISO 17353: 2004·以氣相層析儀/火焰光度偵測器分析。(With reference to ISO 17353: 2004, analysis was performed by GC/FPD.)	mg/kg	0.03	n.d.
二丁基錫 (DBT) (Dibutyl tin (DBT))	參考ISO 17353: 2004·以氣相層析儀/火焰光度偵測器分析。(With reference to ISO 17353: 2004, analysis was performed by GC/FPD.)	mg/kg	0.03	n.d.
二辛基錫 (DOT) (Dioctyl tin (DOT))	參考ISO 17353: 2004,以氣相層析儀/火焰光度偵測器分析。(With reference to ISO 17353: 2004, analysis was performed by GC/FPD.)	mg/kg	0.03	n.d.
聚氯乙烯 (Polyvinyl chloride) (PVC)	參考ASTM E1252: 2021·以傅立葉轉換紅外線光 譜儀及焰色法分析。(With reference to ASTM E1252: 2021, analysis was performed by FT-IR and Flame Test.)	**	-	Negative
砷 (As) (Arsenic (As)) (CAS No.: 7440- 38-2)	參考US EPA 3052: 1996,以感應耦合電漿發射光 譜儀分析。(With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.)	mg/kg	2	n.d.
鈹 (Be) (Beryllium (Be)) (CAS No.: 7440-41-7)	參考US EPA 3052: 1996,以感應耦合電漿發射光 譜儀分析。(With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.)	mg/kg	2	n.d.
銻 (Sb) (Antimony (Sb)) (CAS No.: 7440-36-0)	參考US EPA 3052: 1996.以感應耦合電漿發射光 譜儀分析。(With reference to US EPA 3052: 1996, analysis was performed by ICP-OES.)	mg/kg	2	41.1



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備註(Note):

- 1. mg/kg = ppm; 0.1wt% = 0.1% = 1000ppm
- 2. MDL = Method Detection Limit (方法偵測極限值)
- 3. n.d. = Not Detected (未檢出); 小於MDL / Less than MDL
- 4. "-" = Not Regulated (無規格值)
- 5. **= Qualitative analysis (No Unit) 定性分析(無單位)
- 6. Negative = Undetectable 陰性(未偵測到); Positive = Detectable 陽性(已偵測到)
- 7. 全氟辛烷磺酸及其鹽類包含等物質 (PFOS and its salts including):
 - CAS No.: 1763-23-1, 2795-39-3, 29457-72-5, 29081-56-9, 70225-14-8, 56773-42-3, 251099-16-8, 307-35-7, 91036-71-4, 4021-47-0 and others.
- 8. 全氟辛酸及其鹽類包含等物質 (PFOA and its salts including):
 - CAS No.: 335-67-1, 335-95-5, 2395-00-8, 335-93-3, 335-66-0, 3825-26-1 and others.
- 9. (#2) =
 - a. 當六價鉻結果大於0.13 μg/cm²,表示樣品表層含有六價鉻。(The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 μg/cm². The sample coating is considered to contain Cr(VI).)
 - b. 當六價鉻結果為n.d. (濃度小於0.10 μg/cm²)·表示表層不含六價鉻。(The sample is negative for Cr(VI) if Cr(VI) is n.d. (concentration less than 0.10 μg/cm²). The coating is considered a non-Cr(VI) based coating)
 - c. 當六價鉻結果介於 0.10 及 0.13 $\mu g/cm^2$ 時,無法確定塗層是否含有六價鉻。(The result between 0.10 $\mu g/cm^2$ and 0.13 $\mu g/cm^2$ is considered to be inconclusive unavoidable coating variations may influence the determination.)
- 10. ▲: MDL是針對元素/測試化合物之評估。(The MDL was evaluated for element / tested substance.)

換算公式 (Conversion Formula): AX = A × F

AX	A	F
氧化雙三丁基錫 (Bis(tributyltin)oxide) (TBTO)	三丁基錫 (Tributyl Tin) (TBT)	1.0276

參數換算表 (Parameter Conversion Table):

https://eecloud.sgs.com/Region TW/DocDownload.aspx?name=Others

11. 本報告為 ETR23400889 之異動報告。(This is the additional test report of ETR23400889.)



Test Report

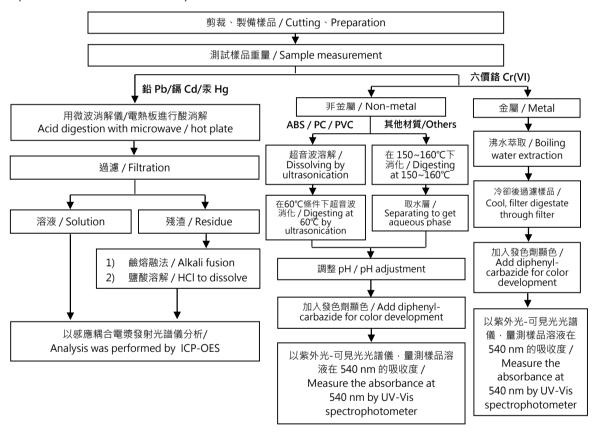
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重金屬流程圖 / Analytical flow chart of heavy metal

根據以下的流程圖之條件,樣品已完全溶解。(六價鉻測試方法除外)

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr^{6+} test method excluded)



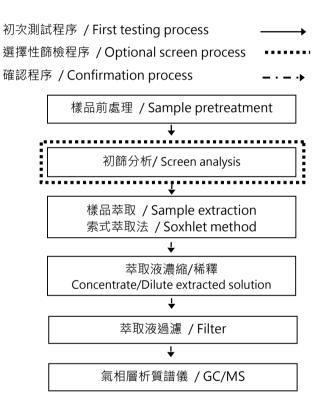


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多溴聯苯/多溴聯苯醚分析流程圖 / Analytical flow chart - PBBs/PBDEs





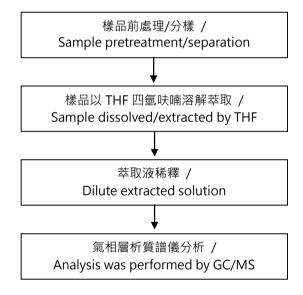
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可塑劑分析流程圖 / Analytical flow chart - Phthalate

【測試方法/Test method: IEC 62321-8】



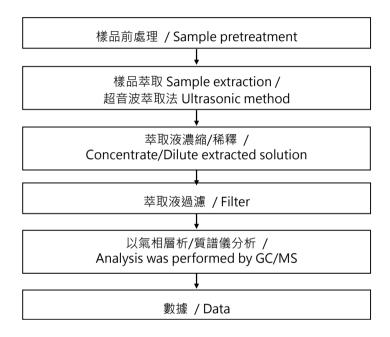


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六溴環十二烷分析流程圖 / Analytical flow chart - HBCDD



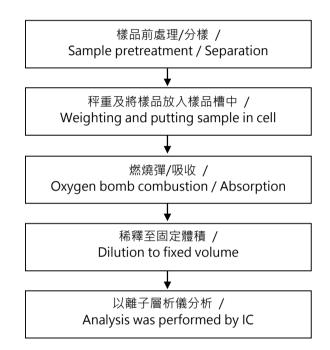


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鹵素分析流程圖 / Analytical flow chart - Halogen



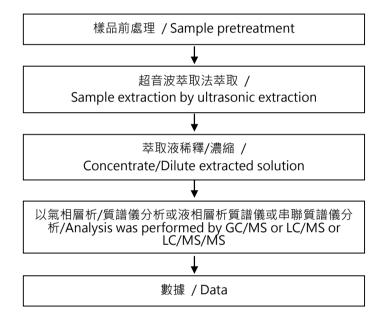


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全氟化合物(包含全氟辛酸/全氟辛烷磺酸/其相關化合物等等)分析流程圖 / Analytical flow chart – PFAS (including PFOA/PFOS/its related compound, etc.)





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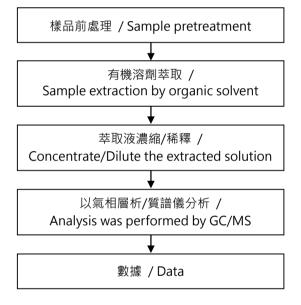
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昇貿科技股份有限公司 (SHENMAO TECHNOLOGY INC.) 桃園市觀音區大潭里大潭北路665號 (NO. 665, DATAN N. RD., GUANYIN DIST., TAOYUAN CITY 328, TAIWAN)

分析流程圖 / Analytical flow chart

【適用於:多氯聯苯、多氯奈、多氯三聯苯、滅蟻靈、氯化石蠟、DBBT】

*Apply to: PCBs, PCNs, PCTs, Mirex, Chlorinated Paraffins, DBBT



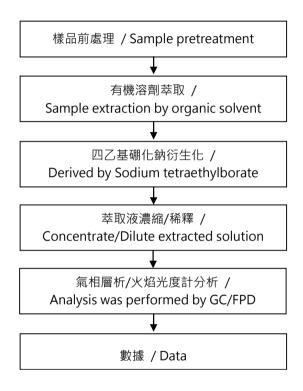


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有機錫分析流程圖 / Analytical flow chart - Organic-Tin



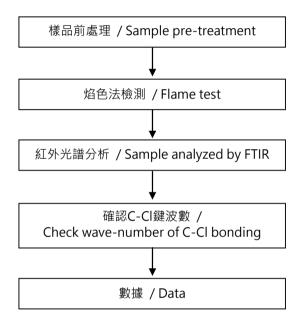


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聚氯乙烯物質判定分析流程圖 / Analysis flow chart - PVC





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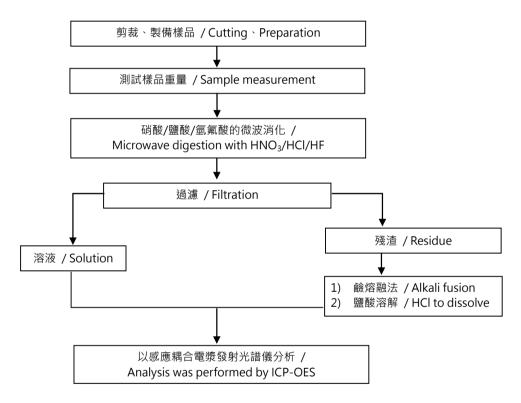
昇貿科技股份有限公司 (SHENMAO TECHNOLOGY INC.) 桃園市觀音區大潭里大潭北路665號 (NO. 665, DATAN N. RD., GUANYIN DIST., TAOYUAN CITY 328, TAIWAN)

元素(含重金屬)分析流程圖 / Analytical flow chart of elements (Heavy metal included)

根據以下的流程圖之條件,樣品已完全溶解。

These samples were dissolved totally by pre-conditioning method according to below flow chart.

【參考方法/Reference method: US EPA 3051A、US EPA 3052】



* US EPA 3051A 方法未添加氫氟酸 / US EPA 3051A method does not add HF.



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* 照片中如有箭頭標示,則表示為實際檢測之樣品/部位. * (The tested sample / part is marked by an arrow if it's shown on the photo.)

ETR23400889



** 報告結尾 (End of Report) **