

检测报告

编号: CANEC25025677202

日期: 2025 年 10 月 29 日

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客户名称: 建滔积层板控股有限公司
客户地址: 香港新界沙田安耀街三號匯達大廈二十三樓

样品名称: FR-4.1
型号: KB-6165G
客户参考信息: KB-6165GC, KB-6169GT, PI-515G

以上样品及信息由客户提供。

SGS 工作编号: GZP25-028835
样品接收时间: 2025 年 10 月 20 日
检测周期: 2025 年 10 月 20 日 ~ 2025 年 10 月 28 日
检测要求: 根据客户要求检测
检测方法: 见后续页。
检测结果: 见后续页。

检测要求	结论
欧盟 RoHS 指令 2011/65/EU 附录 II 的修正指令(EU) 2015/863-铅、汞、镉、六价铬、多溴联苯 (PBB)、多溴二苯醚 (PBDE)、邻苯二甲酸二(2-乙基己基)酯 (DEHP)、邻苯二甲酸丁苄酯 (BBP)、邻苯二甲酸二丁酯 (DBP)和邻苯二甲酸二异丁酯 (DIBP)	符合
AfPS GS 2019:01 PAK-多环芳香烃 (PAHs)	见检测结果
四溴双酚 A (TBBP-A)	见检测结果
中链氯化石蜡(C14-C17) (MCCPs)	见检测结果
石棉	见检测结果
双酚-A	见检测结果
氯化石蜡	见检测结果

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钟臻

Jany Zhong 钟臻
批准签署人

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检测要求	结论
富马酸二甲酯 (DMFu)	见检测结果
甲醛	见检测结果
六溴环十二烷(HBCDD)	见检测结果
有机锡化合物	见检测结果
邻苯二甲酸酯	见检测结果
聚氯乙烯 (PVC)	见检测结果
美国环保署有毒物质控制法 (TSCA) 第 6 (h) 节规定的持久性、生物累积性和毒性 (PBT) 化学物质	符合
卤素	见检测结果
红磷	见检测结果
多氯联苯(PCBs)	见检测结果
多氯萘(PCNs)	见检测结果
多氯三联苯(PCTs)	见检测结果
元素分析	见检测结果

检测结果:

检测部件外观描述:

样品序号	样品编号	SGS 样品 ID	样品描述
SN1	A1	CAN25-0256772-0001.C001	双面覆铜板

备注:

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = 方法检出限
- (3) ND = 未检出 (< MDL)
- (4) "-" = 未规定

欧盟 RoHS 指令 2011/65/EU 附录 II 的修正指令(EU) 2015/863-铅、汞、镉、六价铬、多溴联苯 (PBB)、多溴二苯醚 (PBDE)、邻苯二甲酸二(2-乙基己基)酯 (DEHP)、邻苯二甲酸丁苄酯 (BBP)、邻苯二甲酸二丁酯 (DBP)和邻苯二甲酸二异丁酯 (DIBP)

检测方法: 参考 IEC 62321-4:2013+AMD1:2017, IEC 62321-5:2013, IEC 62321-7-2:2017 和 IEC 62321-12:2023, 采用 ICP-OES/AAS, UV-Vis 和 GC-MS 进行分析。

检测项目	限值	单位	MDL	A1
铅 (Pb)	1000	mg/kg	2	11



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检测项目	限值	单位	MDL	A1
汞 (Hg)	1000	mg/kg	2	ND
镉 (Cd)	100	mg/kg	2	ND
六价铬 (Cr(VI))	1000	mg/kg	8	ND
多溴联苯之和 (PBB)	1000	mg/kg	-	ND
一溴联苯 (MonoBB)	-	mg/kg	25	ND
二溴联苯 (DiBB)	-	mg/kg	25	ND
三溴联苯 (TriBB)	-	mg/kg	25	ND
四溴联苯 (TetraBB)	-	mg/kg	25	ND
五溴联苯 (PentaBB)	-	mg/kg	25	ND
六溴联苯 (HexaBB)	-	mg/kg	25	ND
七溴联苯 (HeptaBB)	-	mg/kg	25	ND
八溴联苯 (OctaBB)	-	mg/kg	25	ND
九溴联苯 (NonaBB)	-	mg/kg	25	ND
十溴联苯 (DecaBB)	-	mg/kg	25	ND
多溴二苯醚之和 (PBDE)	1000	mg/kg	-	ND
一溴二苯醚 (MonoBDE)	-	mg/kg	25	ND
二溴二苯醚 (DiBDE)	-	mg/kg	25	ND
三溴二苯醚 (TriBDE)	-	mg/kg	25	ND
四溴二苯醚 (TetraBDE)	-	mg/kg	25	ND
五溴二苯醚 (PentaBDE)	-	mg/kg	25	ND
六溴二苯醚 (HexaBDE)	-	mg/kg	25	ND
七溴二苯醚 (HeptaBDE)	-	mg/kg	25	ND
八溴二苯醚 (OctaBDE)	-	mg/kg	25	ND
九溴二苯醚 (NonaBDE)	-	mg/kg	25	ND
十溴二苯醚 (DecaBDE)	-	mg/kg	25	ND
邻苯二甲酸二(2-乙基己基)酯 (DEHP)	1000	mg/kg	50	ND
邻苯二甲酸丁苄酯 (BBP)	1000	mg/kg	50	ND
邻苯二甲酸二丁酯 (DBP)	1000	mg/kg	50	ND
邻苯二甲酸二异丁酯 (DIBP)	1000	mg/kg	50	ND

备注:

- (1) 最大允许极限值引用自 RoHS 指令(EU) 2015/863。
 (2) IEC 62321 系列等同于 EN 62321 系列。
 (3) 2021 年 7 月 22 号开始, DEHP, BBP, DBP 和 DIBP 的限制适用于医疗器械, 包括体外医疗器械, 监控仪表, 包括工业监测和控制仪器。

AfPS GS 2019:01 PAK-多环芳香烃 (PAHs)

检测方法: 参考 AfPS GS 2019:01 PAK, 采用 GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
苯并(a)芘 (BaP)	50-32-8	mg/kg	0.1	ND
苯并(e)芘 (BeP)	192-97-2	mg/kg	0.1	ND
苯并(a)蒽 (BaA)	56-55-3	mg/kg	0.1	ND



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检测项目	CAS No.	单位	MDL	A1
苯并(b)荧蒽 (BbF)	205-99-2	mg/kg	0.1	ND
苯并(j)荧蒽 (BjF)	205-82-3	mg/kg	0.1	ND
苯并(k)荧蒽 (BkF)	207-08-9	mg/kg	0.1	ND
蒽 (CHR)	218-01-9	mg/kg	0.1	ND
二苯并(a,h)蒽 (DBA)	53-70-3	mg/kg	0.1	ND
苯并(g,h,i)花(二苯并苯) (BPE)	191-24-2	mg/kg	0.1	ND
茚苯(1,2,3-c,d)芘 (IPY)	193-39-5	mg/kg	0.1	ND
菲 (PHE)	85-01-8	mg/kg	0.1	ND
芘 (PYR)	129-00-0	mg/kg	0.1	ND
蒽 (ANT)	120-12-7	mg/kg	0.1	ND
荧蒽 (FLT)	206-44-0	mg/kg	0.1	ND
4 项多环芳香烃总和[菲 (PHE), 芘 (PYR), 蒽 (ANT), 荧蒽 (FLT)]	-	mg/kg	-	ND
萘 (NAP)	91-20-3	mg/kg	0.1	ND
15 项多环芳香烃总和	-	mg/kg	-	ND
材料分类	-	-	-	-

备注:

AfPS(德国产品安全委员会): 认证对多环芳香烃的要求

参数 单位: mg/kg	1 类	2 类		3 类	
	设计意图为放入口中的材料, 或与皮肤长期接触 (超过 30 秒) 的材料用于 -2009/48/EC 定义的玩具, 或 -供 3 岁以下儿童 a,b 使用。	不属于第 1 类, 设计意图或可预见 d 与皮肤长期接触 (超过 30 秒) 或短期重复接触 e 的材料		不属于第 1 和 2 类, 设计意图或可预见与皮肤短期接触 (不超过 30 秒) 材料	
		a. 供儿童使用的产品	b. 其他产品	a. 供儿童使用的产品	b. 其他产品
苯并(a)芘 (BaP)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
苯并(e)芘 (BeP)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
苯并(a)蒽 (BaA)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
苯并(b)荧蒽 (BbF)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
苯并(j)荧蒽 (BjF)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
苯并(k)荧蒽 (BkF)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
蒽 (CHR), mg/kg	< 0.2	< 0.2	< 0.5	< 0.5	< 1
二苯并(a,h)蒽 (DBA)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
苯并(g,h,i)花(二苯并苯) (BPE)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
茚苯(1,2,3-c,d)芘 (IPY)	< 0.2	< 0.2	< 0.5	< 0.5	< 1
菲 (PHE), 芘 (PYR), 蒽 (ANT), 荧蒽 (FLT)	< 1 (总和)	< 5 (总和)	< 10 (总和)	< 20 (总和)	< 50 (总和)
萘 (NAP)	< 1	< 2		< 10	

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15 PAH 之和	<1	< 5	< 10	< 20	< 50
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注释:

a 儿童是指法定年龄未满 14 周岁的人。

b 供儿童使用包括儿童的主动接触或被动接触。

c “短期重复接触”的定义摘自 REACH 附录 XVII 第 50 条修正案 (EC) No. 1272/2013)。

d 根据德国产品安全法 (ProdSG) (第一章第 2 条第 28 款) 的定义, “可预见的使用”是指将产品投放市场的人无意但可以合理预见的方式使用产品。

备注:

德国产品安全委员会 (AfPS) 于 2020 年 4 月 10 日发布了关于多环芳香烃 (PAHs) 的新文件 (AfPS GS 2019:01 PAK), 该文件将于 2020 年 7 月 1 日起用于 GS-MARK 认证。

四溴双酚 A (TBBP-A)

检测方法: 参考 US EPA 3550C: 2007, 采用 GC-MS 或 LC-MS 或 LC-MS/MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
四溴双酚 A(TBBP-A)	79-94-7	mg/kg	5	ND

中链氯化石蜡(C14-C17) (MCCPs)

检测方法: 参考 ISO 22818:2021, 采用 GC-NCI-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
中链氯化石蜡(C ₁₄ -C ₁₇) (MCCPs)	85535-85-9 和其它	mg/kg	50	ND

石棉

检测方法: 参考 NIOSH 9000:2015 / NIOSH 9002:1994, 采用 XRD / PLM 进行分析。

检测项目	CAS No.	单位	MDL	A1
温石棉	12001-29-5 /132207-32-0	%(m/m)	0.1	阴性
铁镁闪石	12172-73-5	%(m/m)	0.1	阴性
兰闪石	12001-28-4	%(m/m)	0.1	阴性
直闪石	77536-67-5	%(m/m)	0.1	阴性
透闪石	77536-68-6	%(m/m)	0.1	阴性
阳起石	77536-66-4	%(m/m)	0.1	阴性

备注:

(1) 阴性=未检出石棉, 阳性=检出石棉

双酚-A

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检测方法: SGS 内部方法(GZTC CHEM-TOP-075-02, 参考 EPA 3550C:2007 和 EPA 8321B:2007), 采用 HPLC-DAD/MS / LC-MS/MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
双酚-A	80-05-7	mg/kg	1.0	ND

氯化石蜡

检测方法: 参考 ISO 22818:2021, 采用 GC-NCI-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
短链氯化石蜡(SCCP)(C ₁₀ -C ₁₃)	85535-84-8	mg/kg	50	ND

富马酸二甲酯 (DMFu)

检测方法: 溶剂萃取, 采用 GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
富马酸二甲酯 (DMFu)	624-49-7	mg/kg	0.1	ND

甲醛

检测方法: 参考 ISO 14184-1:2011, 采用 UV-Vis 进行分析。

检测项目	单位	MDL	A1
甲醛	mg/kg	16	ND

六溴环十二烷(HBCDD)

检测方法: 参考 IEC 62321-9:2021, 采用 GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
六溴环十二烷(HBCDD)及其非对映异构体(α-HBCDD, β-HBCDD, γ-HBCDD)	134237-50-6 /134237-51-7 /134237-52-8 /25637-99-4 /3194-55-6	mg/kg	20	ND

有机锡化合物

检测方法: 参考 ISO 17353:2004, 采用 GC-MS 进行分析。

检测项目	单位	MDL	A1
二丁基锡(DBT)	mg/kg	0.02	ND
三丁基锡(TBT)	mg/kg	0.02	ND
二辛基锡(DOT)	mg/kg	0.02	ND



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检测报告

编号: CANEC25025677202

日期: 2025 年 10 月 29 日

第 7 页, 共 27 页

检测项目	单位	MDL	A1
三苯基锡 (TPhT)	mg/kg	0.02	ND
三环己基锡 (TCyHT)	mg/kg	0.02	ND
三甲基锡 (TMT)	mg/kg	0.02	ND
三辛基锡 (TOT)	mg/kg	0.02	ND
三丙基锡 (TPT)	mg/kg	0.02	ND

邻苯二甲酸酯

检测方法: 参考 IEC 62321-8:2017, 采用 GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
邻苯二甲酸二丁酯 (DBP)	84-74-2	mg/kg	50	ND
邻苯二甲酸二(2-乙基己基)酯(DEHP)	117-81-7	mg/kg	50	ND
邻苯二甲酸丁苄酯(BBP)	85-68-7	mg/kg	50	ND
邻苯二甲酸二异壬酯(DINP)	28553-12-0 /68515-48-0	mg/kg	50	ND
邻苯二甲酸二辛酯(DNOP)	117-84-0	mg/kg	50	ND
邻苯二甲酸二异癸酯(DIDP)	26761-40-0 /68515-49-1	mg/kg	50	ND
邻苯二甲酸二异丁酯(DIBP)	84-69-5	mg/kg	50	ND
邻苯二甲酸二(2-甲氧基乙基)酯(DMEP)	117-82-8	mg/kg	50	ND
邻苯二甲酸二正己酯(DnHP)	84-75-3	mg/kg	50	ND
邻苯二甲酸二戊酯 (DPENP/ DnPP)	131-18-0	mg/kg	50	ND
邻苯二甲酸二苯酯(DPhP)	84-62-8	mg/kg	50	ND
邻苯二甲酸双十一酯(DUDP)	3648-20-2	mg/kg	50	ND
邻苯二甲酸二甲酯(DMP)	131-11-3	mg/kg	50	ND
邻苯二甲酸二乙酯(DEP)	84-66-2	mg/kg	50	ND
邻苯二甲酸二丙酯(DPrP)	131-16-8	mg/kg	50	ND
邻苯二甲酸二环己酯(DCHP)	84-61-7	mg/kg	50	ND
邻苯二甲酸二苯甲酯(DBzP)	523-31-9	mg/kg	50	ND
邻苯二甲酸二壬酯(DNP)	84-76-4	mg/kg	50	ND
邻苯二甲酸二异辛酯(DIOP)	27554-26-3	mg/kg	50	ND
邻苯二甲酸二丙烯酯(DAP)	131-17-9	mg/kg	50	ND
1,2-苯二甲酸癸基辛基酯(nDnOP)	119-07-3	mg/kg	50	ND
邻苯二甲酸二癸酯(DnDP)	84-77-5	mg/kg	50	ND
邻苯二甲酸二异戊酯(DiPP)	605-50-5	mg/kg	50	ND
邻苯二甲酸正戊基异戊基酯(nPiPP)	776297-69-9	mg/kg	50	ND
邻苯二甲酸二(2-丁氧基)乙酯 (DBEP)	117-83-9	mg/kg	50	ND
邻苯二甲酸二(4-甲基-2-戊基)酯 (BMPP)	146-50-9	mg/kg	50	ND
邻苯二甲酸二(2-乙氧基)乙酯(DEEP)	605-54-9	mg/kg	50	ND
邻苯二甲酸二 C6-C8 支链烷基酯(DIHP)	71888-89-6	mg/kg	50	ND
邻苯二甲酸二正庚酯 (DnHpP)	3648-21-3	mg/kg	50	ND



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Guangzhou Branch: Standards Technical Laboratory

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检测报告

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检测项目	CAS No.	单位	MDL	A1
邻苯二酸-二(C7,C9,C11)烷基酯 (DHNUP)	68515-42-4	mg/kg	50	ND
邻苯二甲酸二(支链与直链)戊基酯 (DPP)	84777-06-0	mg/kg	50	ND
邻苯二甲酸双十三烷基酯(DTDP)	119-06-2	mg/kg	50	ND
邻苯二甲酸二(支链与直链)己基酯 (DHxP)	68515-50-4	mg/kg	50	ND
己二酸二(2-乙基己基)酯(DEHA)	103-23-1	mg/kg	50	ND
对苯二甲酸二(2-乙基己基)酯(DOTP)	6422-86-2	mg/kg	50	ND
己二酸二异壬酯(DINA)	33703-08-1	mg/kg	50	ND
邻苯二甲酸二(2-丙基庚基)酯(DPHpP)	53306-54-0	mg/kg	50	ND
乙酰柠檬酸三丁酯(ATBC)	77-90-7	mg/kg	50	ND
偏苯三酸三(2-乙基己基)酯 (TOTM)	3319-31-1	mg/kg	50	ND

聚氯乙烯 (PVC)

检测方法: SGS 内部方法 (SGS-CCL-TOP-066-01), 采用 FTIR/HATR 进行分析。

检测项目	A1
聚氯乙烯 (PVC)	阴性

备注:

(1) 阴性=未检测到, 阳性= 已检测到。

美国环保署有毒物质控制法 (TSCA) 第 6 (h) 节规定的持久性、生物累积性和毒性 (PBT) 化学物质

检测方法: SGS 内部方法(SGS-CCL-TOP-149-07, 参考 US EPA 方法 3550C:2007), 采用 GC-MS 进行分析。

检测项目	CAS No.	限值	单位	MDL	A1
十溴二苯醚 (Deca-BDE)	1163-19-5	1000	mg/kg	5	ND
异丙基化磷酸三苯酯 (PIP 3:1)	68937-41-7	1000	mg/kg	5	ND
2,4,6-三叔丁基苯酚 (2,4,6-TTBP)	732-26-3	3000	mg/kg	5	ND
六氯丁二烯 (HCBd)	87-68-3	禁用	mg/kg	5	ND
五氯苯硫酚 (PCTP)	133-49-3	10000	mg/kg	5	ND
结论	符合				

备注:

(1) 法规信息请参见下链接

<https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/persistent-bioaccumulative-and-toxic-pbt-chemicals-under>.

(2) 针对十溴二苯醚 (Deca-BDE)和异丙基化磷酸三苯酯 (PIP 3:1) 的规定于 2025 年 1 月 21 日生效。

实施实验室活动的地点: A. 广东省广州高新技术产业开发区科学城科珠路 198 号; B. 广东省广州市黄埔区开创大道 1501 号 3 栋 101 房



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卤素

检测方法: 参考 EN 14582:2016, 采用 IC 进行分析。

检测项目	单位	MDL	A1
氟 (F)	mg/kg	20	829
氯 (Cl)	mg/kg	50	192
溴 (Br)	mg/kg	50	ND
碘 (I)	mg/kg	50	ND

红磷

检测方法: SGS 内部方法 (SGS-CCL-TOP-215-01), 采用 PY-GC/MS/ ICP-OES / GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
红磷	7723-14-0	mg/kg	500	ND

多氯联苯(PCBs)

检测方法: SGS 内部方法, 采用 GC-ECD/GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
2,4,4'-三氯联苯(PCB28)	7012-37-5	mg/kg	0.5	ND
2,2',5,5'-四氯联苯(PCB52)	35693-99-3	mg/kg	0.5	ND
2,2',4,5,5'-五氯联苯(PCB101)	37680-73-2	mg/kg	0.5	ND
2,3',4,4',5-五氯联苯(PCB118)	31508-00-6	mg/kg	0.5	ND
2,2',3,4,4',5'-六氯联苯(PCB138)	35065-28-2	mg/kg	0.5	ND
2,2',4,4',5,5'-六氯联苯(PCB153)	35065-27-1	mg/kg	0.5	ND
2,2',3,4,4',5,5'-七氯联苯(PCB180)	35065-29-3	mg/kg	0.5	ND

多氯萘(PCNs)

检测方法: SGS 内部方法, 采用 GC-ECD/GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
1-一氯萘	90-13-1	mg/kg	5	ND
2-一氯萘	91-58-7	mg/kg	5	ND
1,4-二氯萘	1825-31-6	mg/kg	5	ND
1,5-二氯萘	1825-30-5	mg/kg	5	ND
1,2-二氯萘	2050-69-3	mg/kg	5	ND
1,8-二氯萘	2050-74-0	mg/kg	5	ND
1,2,3-三氯萘	50402-52-3	mg/kg	5	ND
1,2,3,4-四氯萘	20020-02-4	mg/kg	5	ND
1,2,3,4,6-五氯萘	67922-26-3	mg/kg	5	ND

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检测项目	CAS No.	单位	MDL	A1
八氯萘	2234-13-1	mg/kg	5	ND

多氯三联苯(PCTs)

检测方法: SGS 内部方法, 采用 GC-ECD/GC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A1
多氯三联苯 5432	63496-31-1	mg/kg	5	ND
多氯三联苯 5442	12642-23-8	mg/kg	5	ND
多氯三联苯 5460	11126-42-4	mg/kg	5	ND

元素分析

检测方法: 参考 US EPA 3052:1996, 采用 ICP-OES/AAS 进行分析。

检测项目	单位	MDL	A1
砷(As)	mg/kg	10	ND
铍(Be)	mg/kg	5	ND
镍(Ni)	mg/kg	5	ND
锑(Sb)	mg/kg	10	ND

除非另有说明, 参照 ILAC-G8:09/2019, 使用简单接受 ($w=0$) 的二元判定规则进行符合性判定。

除非另有说明, 此报告结果仅对检测的样品负责。本报告未经本公司书面许可, 不可部分复制。

检测报告仅用于客户科研、教学、内部质量控制、产品研发等目的, 仅供内部参考。

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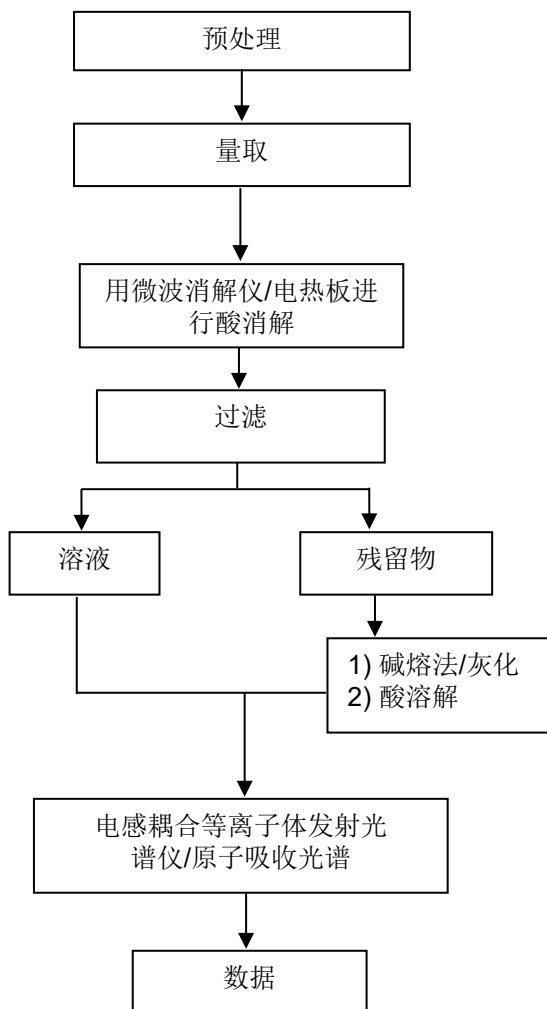
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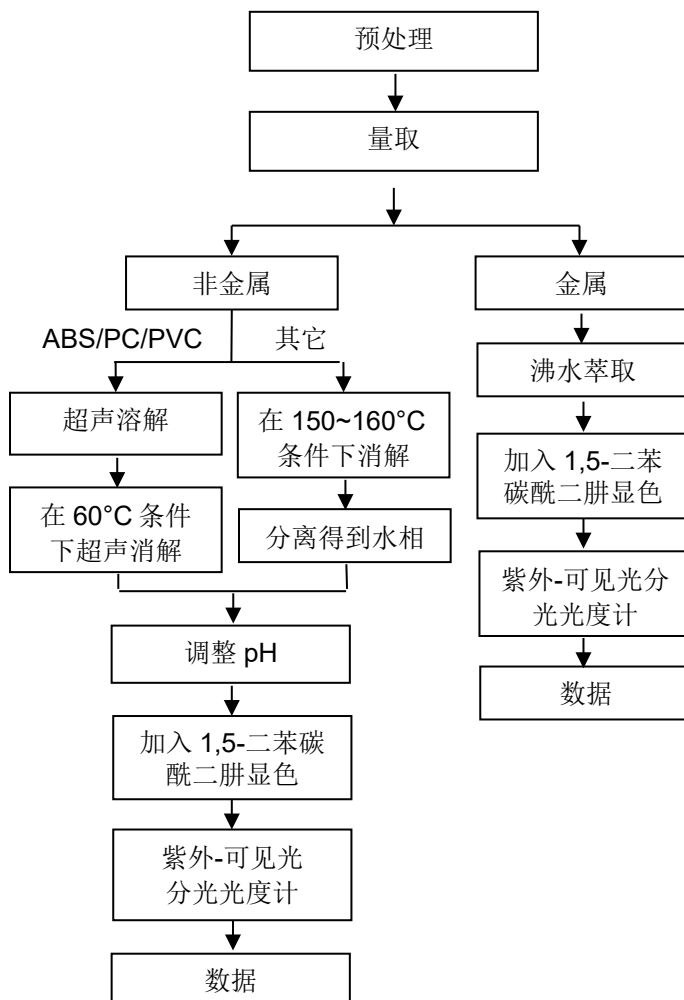
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元素检测流程图

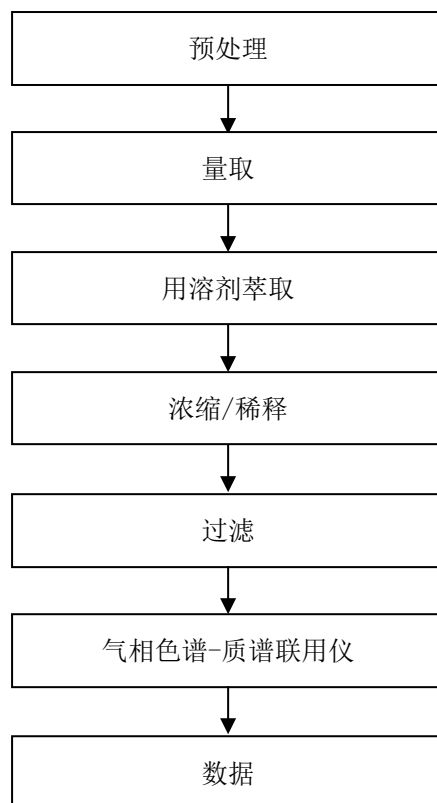
样品按照下述流程被完全消解



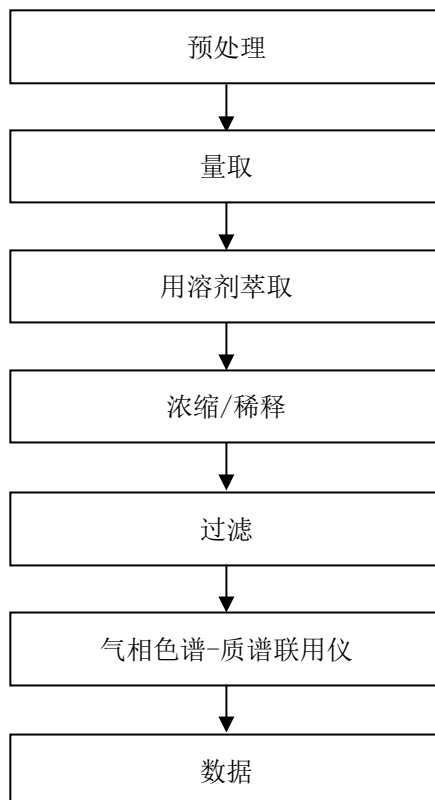
六价铬检测流程图



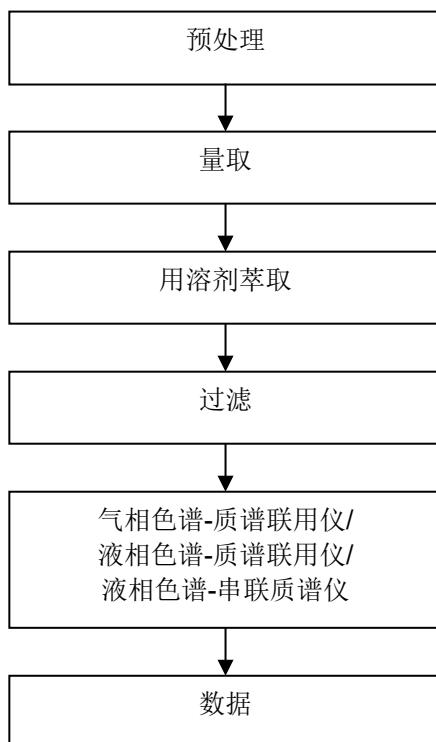
PBB(s)/PBDE(s)/Phthalates 检测流程图



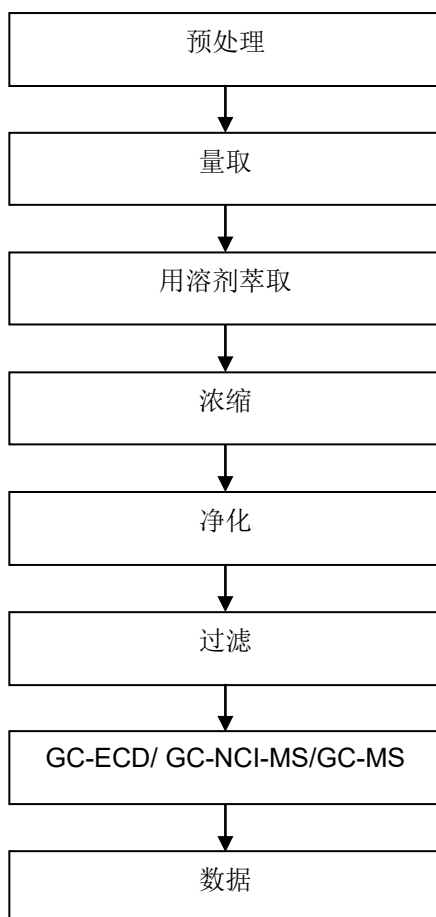
PAHs 检测流程图



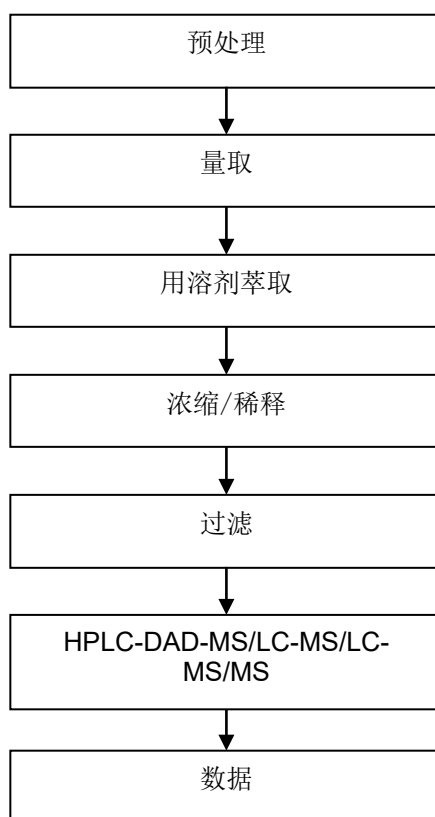
TBBP-A 检测流程图



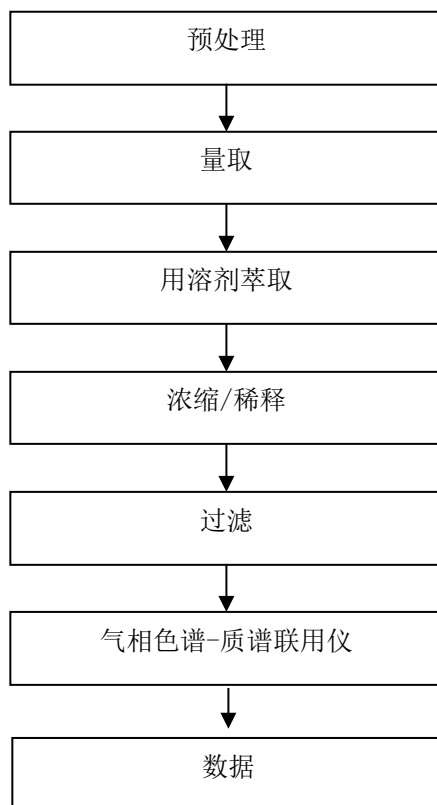
氯化石蜡检测流程图



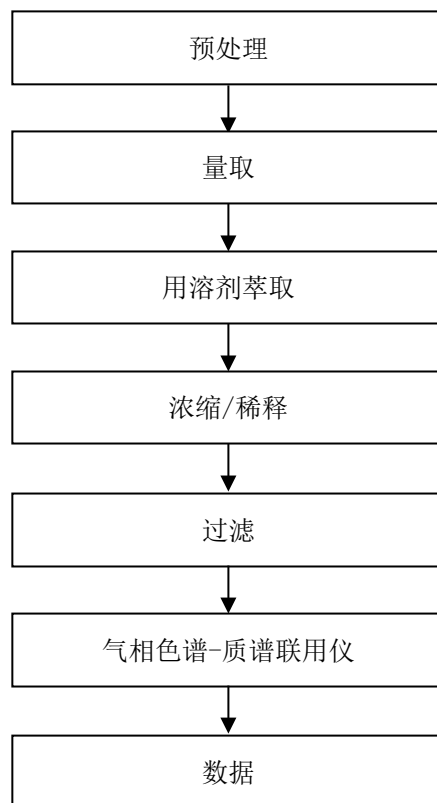
双酚类化合物检测流程图



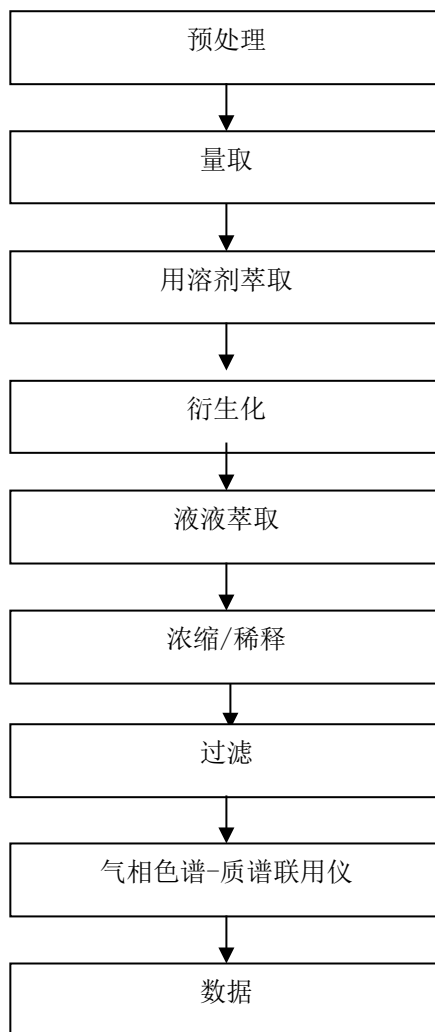
DMF(富马酸二甲酯)检测流程图



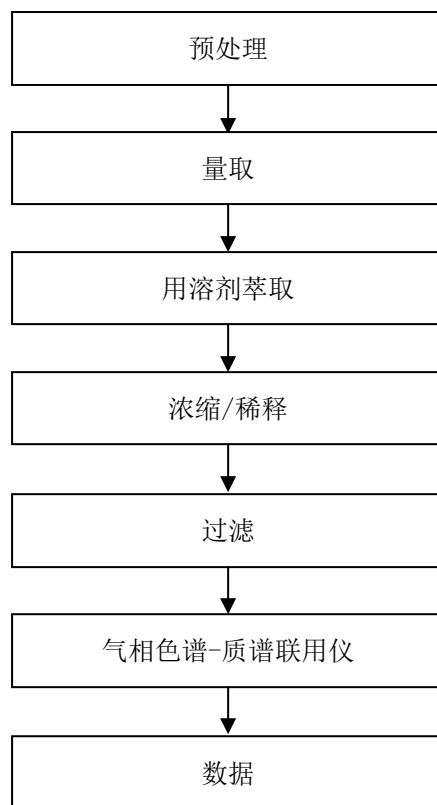
HBCDD 检测流程图



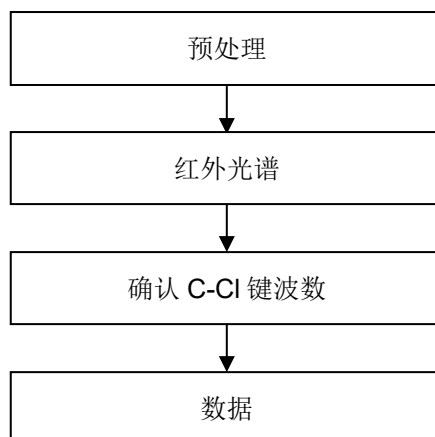
有机锡检测流程图



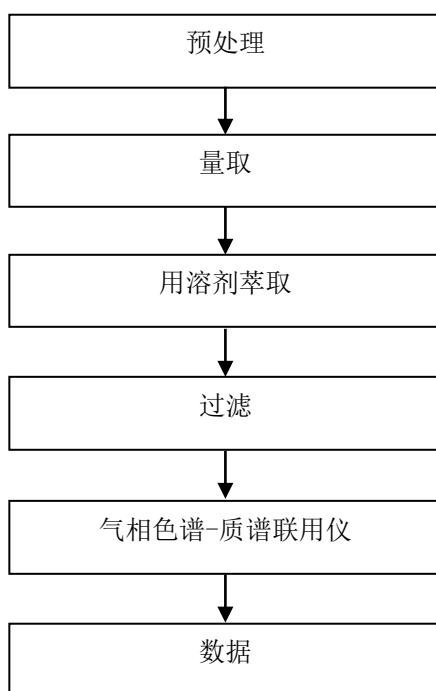
Phthalates 检测流程图



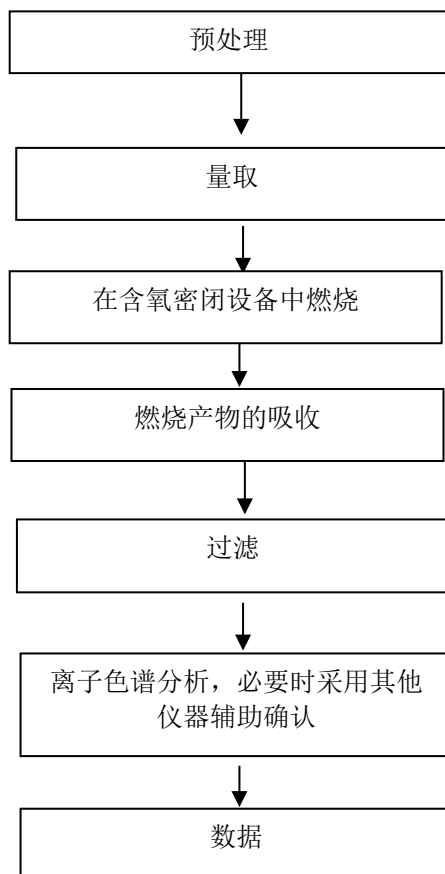
PVC 检测流程图



持久性、生物累积性和毒性 (PBT) 化学物质检测流程图

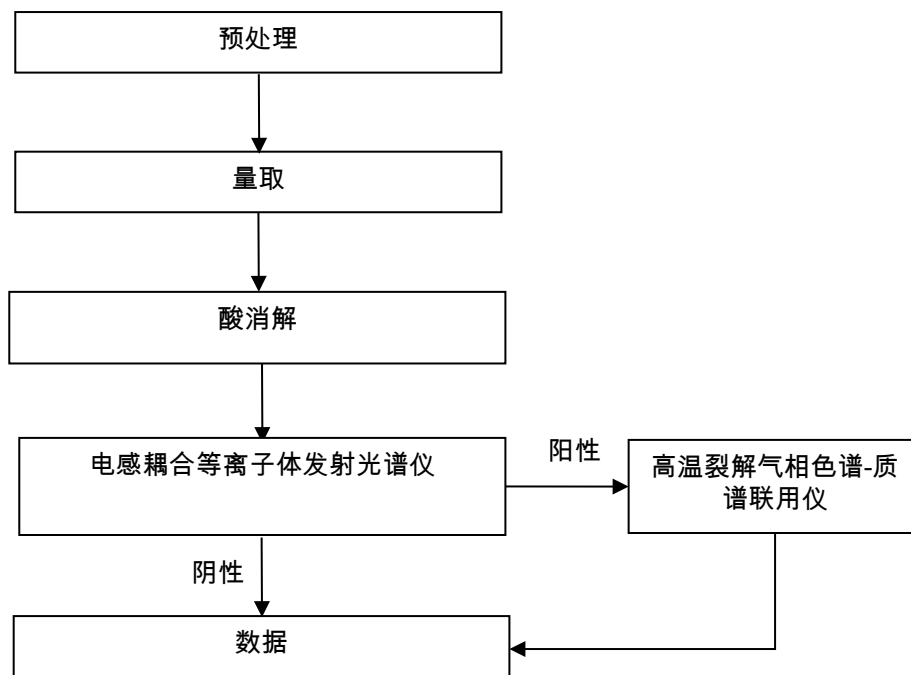


卤素检测流程图



附件

红磷检测流程图



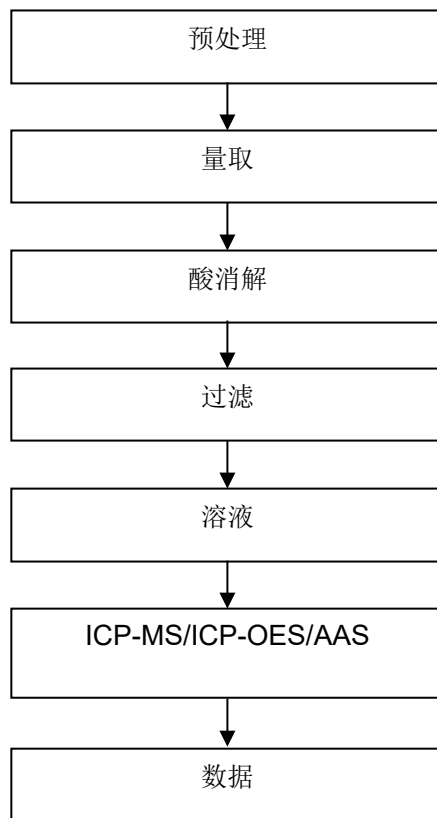
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元素检测流程图



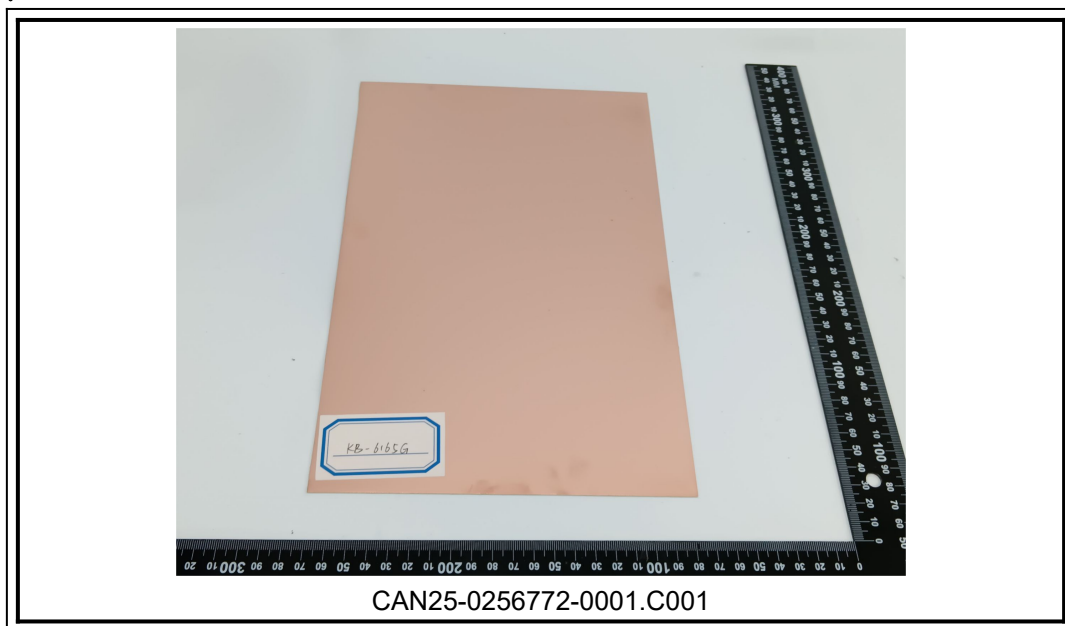
检测报告

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No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou, Guangdong, China 510663
中国·广东·广州高新技术产业开发区科学城科珠路198号 邮编: 510663

t (86-20) 82155555 www.sgsgroup.com.cn
t (86-20) 82155555 sgs.china@sgs.com