

检测报告 **日期:** 2025年09月29日 第1页,共21页 编号: SHAEC25024596506

客户名称: 常州星海电子股份有限公司

客户地址: 江苏省常州市新北区天目湖路 1号

样品名称: 塑封二极管 (无卤)

型号: DO-41

客户参考信息: R-1、R-3、A-405、DO-15、DO-201AD、DO-201AE、R-6、R-6C、R-6D、R-

> -6E、R-6F、RS、DO-213AA、DO-213AB、DO-214AA、DO-214AB、DO-214AC、DO-215AC、DO-216AA、DO-218AB、SMAG、SMBG、SMCG、 SMAX、SMAXS、SMBX、SMBF、SMAGD、SMAF、SMAS、SMF、SOD-123FL、SOD-123SL、SCVB、S25VB、MBL、MBM、MBN、MBS、MBF、 MSBL、GF002、GF006、GF007、GF008、GF009、GF010、GF011、 GF012、GF012-K、GF013、GF015、GF09E、BR、ABS、ABF、ABM、 DB、DBS、DBF、DBSW、DBM、DF、DFS、DF1006-2、DFN1006-2、 DFN1610-2L、DFN2510-10L、UMB、SBR、KBP、KBU、KBJ、KBL、 GBPC、GBP、GBPCW、GBJ、GBU、4GBJ、2GBJ、6GBJ、GBJ2、 GBJ6、GBL、KBPC、KBPC-W、WOB、WBFBP-02L、TO-252、TO-252-2L、TO-252-3L、TO-251、TO-263AB、TO-263-2L、TO-263-3L、TO-263、 ITO-220AB、ITO-220AC、TO-220、TO-220F、TO-277、TO-277B、TO-220AB、TO-220AC、TO-220AC-A、TO-220AC-C、TO-92、RS-2、RS-4、 RS-6、TO-247-2L、TO-247-3L、TO-247-3L、TO-247-4L、SGBJ、D3K、

D4K、TO-247AB、TO-247AC PACKAGE

以上样品及信息由客户提供。

SGS 工作编号: SHP25-032262

样品接收时间: 2025年09月18日

2025年09月18日~2025年09月26日 检测周期:

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。

通标标准技术服务(上海)有限公司 授权签名

倪俊

Tom Ni 倪俊 批准签署人





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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
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
元素	见检测结果
短链氯化石蜡(SCCPs)	见检测结果
六溴环十二烷 (HBCDD)	见检测结果
卤素	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	A7	SHA25-0245965-0001.C007	银灰色芯片
SN2	A8	SHA25-0245965-0001.C008	银色固体
SN3	A9	SHA25-0245965-0001.C009	银色金属
SN4	A10	SHA25-0245965-0001.C010	黑色固体
SN5	A11	SHA25-0245965-0001.C011	银色金属
SN6	A12	SHA25-0245965-0001.C012	银灰色液体

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)

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



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检测项目	限值	单位	MDL	A7	A8	A10
铅 (Pb)	1000	mg/kg	2	74165▲	ND	4
汞 (Hg)	1000	mg/kg	2	ND	ND	ND
镉 (Cd)	100	mg/kg	2	ND	ND	ND
六价铬 (Cr(VI))	1000	mg/kg	8	ND	ND	ND
多溴联苯之和 (PBB)	1000	mg/kg	-	ND	ND	ND
一溴联苯 (MonoBB)	-	mg/kg	25	ND	ND	ND
二溴联苯 (DiBB)	-	mg/kg	25	ND	ND	ND
三溴联苯 (TriBB)	-	mg/kg	25	ND	ND	ND
四溴联苯 (TetraBB)	-	mg/kg	25	ND	ND	ND
五溴联苯 (PentaBB)	-	mg/kg	25	ND	ND	ND
六溴联苯 (HexaBB)	-	mg/kg	25	ND	ND	ND
七溴联苯 (HeptaBB)	-	mg/kg	25	ND	ND	ND
八溴联苯 (OctaBB)	-	mg/kg	25	ND	ND	ND
九溴联苯 (NonaBB)	-	mg/kg	25	ND	ND	ND
十溴联苯 (DecaBB)	-	mg/kg	25	ND	ND	ND
多溴二苯醚之和 (PBDE)	1000	mg/kg	-	ND	ND	ND
一溴二苯醚 (MonoBDE)	-	mg/kg	25	ND	ND	ND
二溴二苯醚 (DiBDE)	-	mg/kg	25	ND	ND	ND
三溴二苯醚 (TriBDE)	-	mg/kg	25	ND	ND	ND
四溴二苯醚 (TetraBDE)	-	mg/kg	25	ND	ND	ND
五溴二苯醚 (PentaBDE)	-	mg/kg	25	ND	ND	ND
六溴二苯醚 (HexaBDE)	-	mg/kg	25	ND	ND	ND
七溴二苯醚 (HeptaBDE)	-	mg/kg	25	ND	ND	ND
八溴二苯醚 (OctaBDE)	-	mg/kg	25	ND	ND	ND
九溴二苯醚 (NonaBDE)	-	mg/kg	25	ND	ND	ND
十溴二苯醚 (DecaBDE)	-	mg/kg	25	ND	ND	ND
邻苯二甲酸二(2-乙基己基)酯 (DEHP)	1000	mg/kg	50	ND	ND	ND
邻苯二甲酸丁苄酯 (BBP)	1000	mg/kg	50	ND	ND	ND
邻苯二甲酸二丁酯 (DBP)	1000	mg/kg	50	ND	ND	ND
邻苯二甲酸二异丁酯 (DIBP)	1000	mg/kg	50	ND	ND	ND

检测项目	限值	单位	MDL	A12
铅 (Pb)	1000	mg/kg	2	ND
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



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检测项目	限值	单位	MDL	A12
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。

检测方法: 参考 IEC 62321-4:2013+AMD1:2017, IEC 62321-5:2013, IEC 62321-7-1:2015 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	A11
铅 (Pb)	1000	mg/kg	2	ND
汞 (Hg)	1000	mg/kg	2	ND
镉 (Cd)	100	mg/kg	2	ND
六价铬 (Cr(VI))▼	-	μg/cm²	0.10	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



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检测项目	限值	单位	MDL	A11
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

- (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。
- a. 当六价铬的浓度高于0.13 μg/cm²时,样品为阳性,即含有六价铬;
 - b. 当六价铬的浓度为ND (低于0.10 μg/cm²) 时,样品为阴性,即未检测到六价铬;
 - c. 当六价铬的浓度介于0.10 μg/cm²与0.13 μg/cm²之间时,无法直接判定是否检测到六价铬,因不 同个体的样品表面差异可能会影响测定结果。

由于未获知样品的存储条件和生产日期,样品的六价铬检测结果仅能代表检测时样品含六价铬的状态。

检测方法: 参考滴定法,IEC 62321-4:2013+AMD1:2017,IEC 62321-5:2013, IEC 62321-7-1:2015 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	A9
铅(Pb)	0.1	%	-	93.0▲
汞(Hg)	1000	mg/kg	2	ND
镉(Cd)	100	mg/kg	2	ND
六价铬 (Cr(VI))▼	-	μg/cm²	0.10	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



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检测项目	限值	单位	MDL	A9
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) ▼ = a. 当六价铬的浓度高于0.13 µg/cm²时,样品为阳性,即含有六价铬。
 - b. 当六价铬的浓度为ND (低于0.10 µg/cm²) 时,样品为阴性,即未检测到六价铬。
 - c. 当六价铬的浓度介于0.10 μg/cm²与0.13 μg/cm²之间时,无法直接判定是否检测到六价铬,因不同个体的样品表面差异可能会影响测定结果。

<u>四溴双酚 A (TBBP-A)</u>

四溴双酚 A (TBBP-A)

检测方法: 参考 SGS 内部方法,采用 GC-MS 或者 LC-MS 进行分析。

检测项目	CAS No.	单位	MDL	A7	A8	A9
四溴双酚 A (TBBP-A)	79-94-7	mg/kg	5	ND	ND	ND
检测项目	CAS No.	单位	MDL	A10	A11	A12

mg/kg

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。



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检测项目	CAS No.	单位	MDL	A7	A8	A9
中链氯化石蜡(C ₁₄ -C ₁₇) (MCCPs)	85535-85-9 和其它	mg/kg	50	ND	ND	ND

检测项目	CAS No.	单位	MDL	A10	A11	A12
中链氯化石蜡(C ₁₄ -C ₁₇) (MCCPs)	85535-85-9 和其它	mg/kg	50	ND	ND	ND

元素

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	A7	A8	A10
铍(Be)	mg/kg	5	ND	ND	ND
锑(Sb)	mg/kg	10	ND	ND	ND
三氧化二锑(Sb ₂ O ₃) ◆	mg/kg	12	ND	ND	ND

检测项目	单位	MDL	A12
铍(Be)	mg/kg	5	ND
锑(Sb)	mg/kg	10	ND
三氧化二锑(Sb ₂ O ₃) ◆	mg/kg	12	ND

备注:

◆三氧化二锑:由锑含量换算得之

检测方法: 参考 US EPA 3050B:1996, 采用 ICP-OES/AAS 进行分析。

检测项目	单位	MDL	A9	A11
锑(Sb)	mg/kg	10	ND	ND
三氧化二锑(Sb ₂ O ₃) ◆	mg/kg	12	ND	ND
铍(Be)	mg/kg	5	ND	ND

备注:

◆三氧化二锑:由锑含量换算得之

短链氯化石蜡(SCCPs)

参考 ISO 18219-1:2021, 采用 GC-NCI-MS 进行分析。 检测方法:

检测项目	CAS No.	单位	MDL	A7	A8	A9
短链氯化石蜡(SCCP) (C10-C13)	85535-84-8	mg/kg	50	ND	ND	ND



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检测项目	CAS No.	单位	MDL	A10	A11	A12
短链氯化石蜡(SCCP) (C10-C13)	85535-84-8	mg/kg	50	ND	ND	ND

六溴环十二烷 (HBCDD)

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

检测项目	CAS No.	单位	MDL	A7	A8	A9
	134237-50-6					
 六溴环十二烷 (HBCDD)	/134237-51-7 /134237-52-8	mg/kg	10	ND	ND	ND
, ,	/25637-99-4					
	/3194-55-6					

检测项目	CAS No.	单位	MDL	A10	A11	A12
六溴环十二烷 (HBCDD)	134237-50-6 /134237-51-7 /134237-52-8 /25637-99-4 /3194-55-6	mg/kg	10	ND	ND	ND

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	A7	A8	A9
氟 (F)	mg/kg	20	ND	ND	ND
氯 (CI)	mg/kg	50	ND	ND	ND
溴 (Br)	mg/kg	50	ND	ND	ND
碘 (I)	mg/kg	50	ND	ND	ND

检测项目	单位	MDL	A10	A11	A12
氟 (F)	mg/kg	20	ND	ND	ND
氯 (CI)	mg/kg	50	177	ND	179
溴 (Br)	mg/kg	50	ND	ND	ND
碘 (I)	mg/kg	50	ND	ND	ND

▲根据客户提供的声明,编号 A7 中的铅(Pb)被欧盟 RoHS 指令 2011/65/EU 豁免,相应豁免条文(请以英文原文为准) |ANNEX III 7(c)-I|: 电子电气元件中玻璃或陶瓷材料(电容中陶瓷介质除外)所含的铅,如压电设备、玻璃或陶瓷基复合元件。

更多豁免相关信息,可以从以下链接获取:

https://rohs.sgsonline.com.cn/PDFLinks/zh-cn/RSTS-TP-037%20RoHS%20Exemption%20%28CN%29.pdf 检测结果仅供参考。

▲根据客户提供的声明,编号 A9 中的铅(Pb)被欧盟 RoHS 指令 2011/65/EU 豁免,相应豁免条文(请以英文原文为准) |ANNEX III 7(a)|: 高熔点型焊料中的铅(即铅含量等于或大于 85%的铅基合金焊料)。 更多豁免相关信息,可以从以下链接获取:

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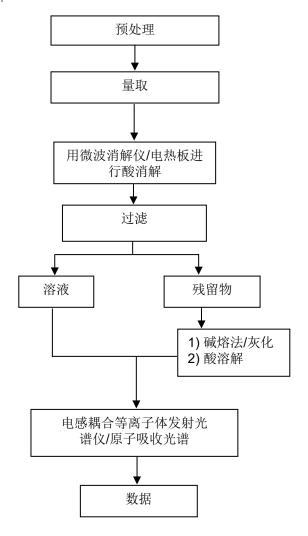
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附件

元素检测流程图

样品按照下述流程被完全消解





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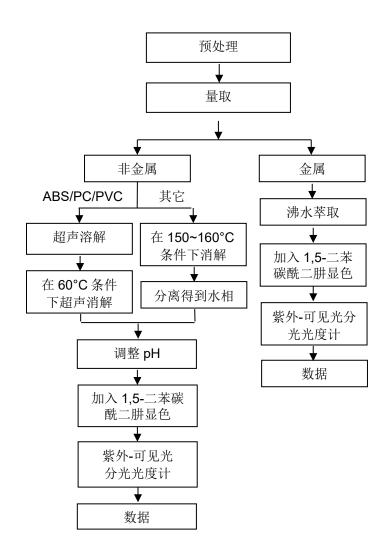


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六价铬检测流程图





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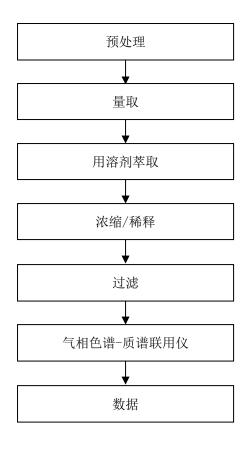


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PBB(s)/PBDE(s)/Phthalates 检测流程图





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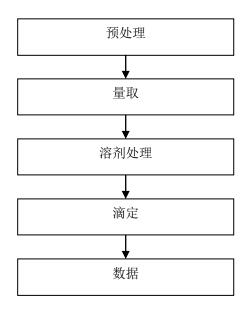


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滴定检测流程图





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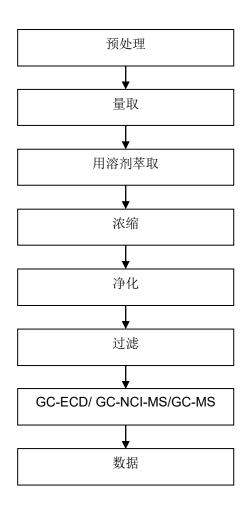


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氯化石蜡检测流程图





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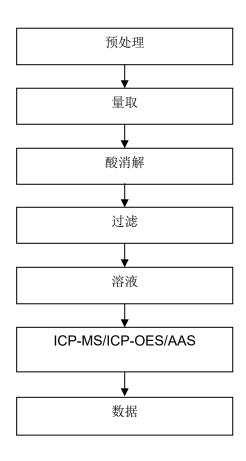


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元素检测流程图





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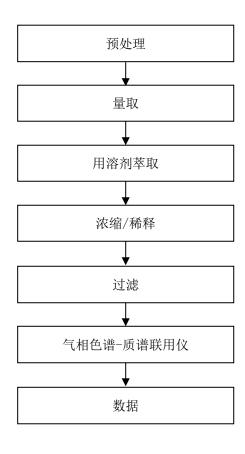


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HBCDD 检测流程图





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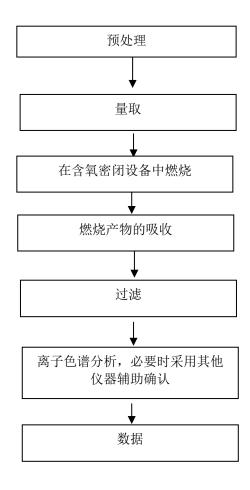


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卤素检测流程图





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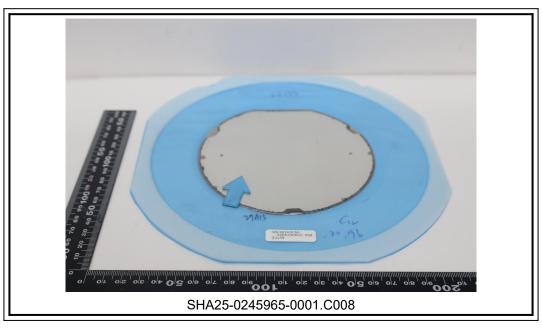
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