

TEST REPORT (시험 성적서)

신청기관 (인) : 삼성전기
APPLICANT : SAMSUNG ELECTRO-MECHANICS
주소 (한글) : 세종특별자치시 연동면 삼성길 25
ADDRESS (ENGL.) : 25, Samseong-gil, Yeondong-myeon,
Sejong-si, Korea

발행면수 (PAGE) : 1 of 11
발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료 명세 (SAMPLE DESCRIPTION) : 시료에 대한 상세한 정보는 아래와 같음
(The following submitted sample(s) said to be)

제품명/형식 (NAME/TYPE OF PRODUCT) : Ni Plating
(Ni Plating)

재질 (NAME OF MATERIAL) : Substrate (BGA)
(Substrate (BGA))

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001
(RT25R-S1841-001)

품번 (ITEM NO.) : Ni Plating
(Ni Plating)

제품 생산자/공급자 (MANUFACTURER/VENDOR) : 삼성전기
(SAMSUNG ELECTRO-MECHANICS)

시료접수일자 (SAMPLE RECEIVED) : 2025. 03. 11.
(Mar. 11, 2025)

시험일자 (TESTING DATE) : 2025. 03. 11. ~ 2025. 03. 17.
(Mar. 11, 2025 ~ Mar. 17, 2025)

시험방법 (TEST METHOD) : 이 시험성적서의 다음 페이지 첨부
(Please see the following page)

시험결과 (TEST RESULT) : 이 시험성적서의 다음 페이지 첨부
(Please see the following page)

- 비고 (Notes):
- 이 시험성적서는 제시된 시료 및 시료명으로 시험한 결과로서 유사 대상시료에 적용할 수 없음.
(The test results presented in this report refer only to the object tested.)
 - 이 시험성적서는 승인없이 복사 사용을 금함.
(This report shall not be reproduced except in full without the written approval of the testing laboratory.)
 - 이 시험성적서의 품번은 고객의 요청 및 보증서에 의거하여 명기함.
(The item no. is assigned by client and indicated according to their requirement and guarantee letter.)

승인자 (Approved by)

이청수/기술책임자
(Nikkie Lee / Lab. Technical Manager)

권한자 (Authorized by)

장준용/소장
(Jade Jang / Lab. General Manager)



Authenticity check



TEST REPORT
(시험 성적서)

발행면수 (PAGE) : 2 of 11
발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

| 시험항목 (TEST ITEM) | 단위 (UNIT) | 분석방법 (TEST METHOD) | 검출한계 (MDL) | 시험결과 (RESULT) |
|---|--------------------|--|---------------|------------------|
| 카드뮴 (Cadmium, Cd) | mg/kg | With reference to IEC 62321-5 Edition 1.0 : 2013, by acid digestion and determined by ICP-OES | 0.5 | N.D. |
| 납 (Lead, Pb) | mg/kg | | 5 | N.D. |
| 수은 (Mercury, Hg) | mg/kg | With reference to IEC 62321-4 : 2013/AMD1 : 2017, by acid digestion and determined by ICP-OES | 2 | N.D. |
| 6가 크롬 (Hexavalent Chromium, Cr ⁶⁺) (For Substrate (BGA)) | μg/cm ² | With reference to IEC 62321-7-1 Edition 1.0 : 2015, by boiling water extraction and determined by UV-VIS Spectrophotometer | 0.10 | Negative |

Tested by : Jooyeon Lee, Chano Kim

Notes : mg/kg = ppm = parts per million (함량 표시 : 백만분의 일)
μg/cm² = microgram per square centimeter
< = Less than (결과 값 이하)
N.D. = Not detected (< MDL, 미검출 - 검출한계 이하)
MDL = Method detection limit (검출한계)

Remarks : Interpretation of Cr⁶⁺ results

| Qualitative result | Concentration of Cr ⁶⁺ (μg/cm ²) | Meaning |
|--------------------|--|--|
| Negative | < 0.10 | The sample coating is considered a non-Cr ⁶⁺ based coating. |
| Inconclusive | 0.10 ≤ and ≤ 0.13 | Unavoidable coating variation may influence the determination. |
| Positive | > 0.13 | The sample coating is considered to contain Cr ⁶⁺ . |

1. The qualitative results should be determination by the average result of three test results.
(If concentration of Cr⁶⁺ is over 0.10μg/cm²)
2. The above results will be carried out by visual comparison only with the standard.



TEST REPORT
(시험 성적서)

발행면수 (PAGE) : 3 of 11
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시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

| 시험항목 (TEST ITEM) | 단위 (UNIT) | 분석방법 (TEST METHOD) | 검출한계 (MDL) | 시험결과 (RESULT) |
|--|--------------|--|---------------|------------------|
| 폴리브롬화비페닐 (Polybrominated Biphenyls, PBBs) | | | | |
| 모노브로모비페닐 (MonoBB) | mg/kg | With reference to IEC 62321-6 Edition 1.0 : 2015, by solvent extraction and determined by GC/MS | 5 | N.D. |
| 다이브로모비페닐 (DiBB) | mg/kg | | 5 | N.D. |
| 트라이브로모비페닐 (TriBB) | mg/kg | | 5 | N.D. |
| 테트라브로모비페닐 (TertaBB) | mg/kg | | 5 | N.D. |
| 펜타브로모비페닐 (PentaBB) | mg/kg | | 5 | N.D. |
| 헥사브로모비페닐 (HexaBB) | mg/kg | | 5 | N.D. |
| 헵타브로모비페닐 (HeptaBB) | mg/kg | | 5 | N.D. |
| 옥타브로모비페닐 (OctaBB) | mg/kg | | 5 | N.D. |
| 노나브로모비페닐 (NonaBB) | mg/kg | | 5 | N.D. |
| 데카브로모비페닐 (DecaBB) | mg/kg | | 5 | N.D. |
| 폴리브롬화디페닐에테르 (Polybrominated Diphenyl Ethers, PBDEs) | | | | |
| 모노브로모디페닐에테르 (MonoBDE) | mg/kg | With reference to IEC 62321-6 Edition 1.0 : 2015, by solvent extraction and determined by GC/MS | 5 | N.D. |
| 다이브로모디페닐에테르 (DiBDE) | mg/kg | | 5 | N.D. |
| 트라이브로모디페닐에테르 (TriBDE) | mg/kg | | 5 | N.D. |
| 테트라브로모디페닐에테르 (TetraBDE) | mg/kg | | 5 | N.D. |
| 펜타브로모디페닐에테르 (PentaBDE) | mg/kg | | 5 | N.D. |
| 헥사브로모디페닐에테르 (HexaBDE) | mg/kg | | 5 | N.D. |
| 헵타브로모디페닐에테르 (HeptaBDE) | mg/kg | | 5 | N.D. |
| 옥타브로모디페닐에테르 (OctaBDE) | mg/kg | | 5 | N.D. |
| 노나브로모디페닐에테르 (NonaBDE) | mg/kg | | 5 | N.D. |
| 데카브로모디페닐에테르 (DecaBDE) | mg/kg | | 5 | N.D. |

Tested by : Hayan Park

Notes : mg/kg = ppm = parts per million (함량 표시 : 백만분의 일)
< = Less than (결과 값 이하)
N.D. = Not detected (< MDL, 미검출 - 검출한계 이하)
MDL = Method detection limit (검출한계)



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TEST REPORT
(시험 성적서)

발행면수 (PAGE) : 4 of 11

발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

| 시험항목 (TEST ITEM) | 단위 (UNIT) | 분석방법 (TEST METHOD) | 검출한계 (MDL) | 시험결과 (RESULT) |
|---|--------------|--|---------------|------------------|
| 브롬 (Bromine, Br) | mg/kg | With reference to EN 14582, by oxygen combustion with bomb and determined by IC | 30 | N.D. |
| 염소 (Chlorine, Cl) | mg/kg | With reference to EN 14582, by oxygen combustion with bomb and determined by IC | 30 | N.D. |
| 플루오르 (Fluorine, F) | mg/kg | With reference to EN 14582, by oxygen combustion with bomb and determined by IC | 30 | N.D. |
| 요오드 (Iodine, I) | mg/kg | With reference to EN 14582, by oxygen combustion with bomb and determined by IC | 30 | N.D. |
| 비소 (Arsenic, As) | mg/kg | With reference to US EPA 3052, by acid digestion and determined by ICP-OES | 2 | N.D. |
| 베릴륨 (Beryllium, Be) | mg/kg | With reference to US EPA 3052, by acid digestion and determined by ICP-OES | 2 | N.D. |
| 안티몬 (Antimony, Sb) | mg/kg | With reference to US EPA 3052, by acid digestion and determined by ICP-OES | 2 | N.D. |
| 헥사브로모시클로도데칸 (Hexabromocyclododecane, HBCDD) | mg/kg | With reference to IEC 62321-9 : 2021, by solvent extraction and determined by LC/MS and GC/MS | 10 | N.D. |
| 퍼플루오로옥타노익에시드 (Perfluorooctanoic acid, PFOA) | mg/kg | With reference to US EPA 3550C/8321B, by ultrasonic extraction and determined by LC/MS or LC/MS/MS | 0.025 | N.D. |
| 퍼플루오로옥탄설포네이트 (Perfluorooctane sulfonate, PFOS) | mg/kg | With reference to US EPA 3550C/8321B, by ultrasonic extraction and determined by LC/MS or LC/MS/MS | 0.025 | N.D. |

Tested by : Chano Kim, Jooyeon Lee, Hayan Park

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 MDL = Method detection limit (검출한계)

Intertek Testing Services Korea Ltd.

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TEST REPORT
(시험 성적서)

발행면수 (PAGE) : 5 of 11

발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

| 시험항목 (TEST ITEM) | CAS번호 (CAS NO.) | 단위 (UNIT) | 분석방법 (TEST METHOD) | 검출한계 (MDL) | 시험결과 (RESULT) |
|---|--------------------|--------------|--|---------------|------------------|
| 디부틸프탈레이트 (Dibutyl phthalate, DBP) | 84-74-2 | mg/kg | With reference to IEC 62321-8 Edition 1.0 : 2017, by solvent extraction and determined by GC/MS | 50 | N.D. |
| 디에틸헥실프탈레이트 (Di-(2-ethylhexyl) phthalate, DEHP) | 117-81-7 | mg/kg | | 50 | N.D. |
| 벤질부틸프탈레이트 (Benzyl butyl phthalate, BBP) | 85-68-7 | mg/kg | | 50 | N.D. |
| 디이소부틸프탈레이트 (Diisobutyl phthalate, DIBP) | 84-69-5 | mg/kg | | 50 | N.D. |

Tested by : Hayan Park

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 <= Less than (결과 값 이하)
 N.D. = Not detected (< MDL, 미검출 - 검출한계 이하)
 MDL = Method detection limit (검출한계)

* 시료 접수 시 시료 상태 :
(View of sample as received)



TEST REPORT

(시험성적서)

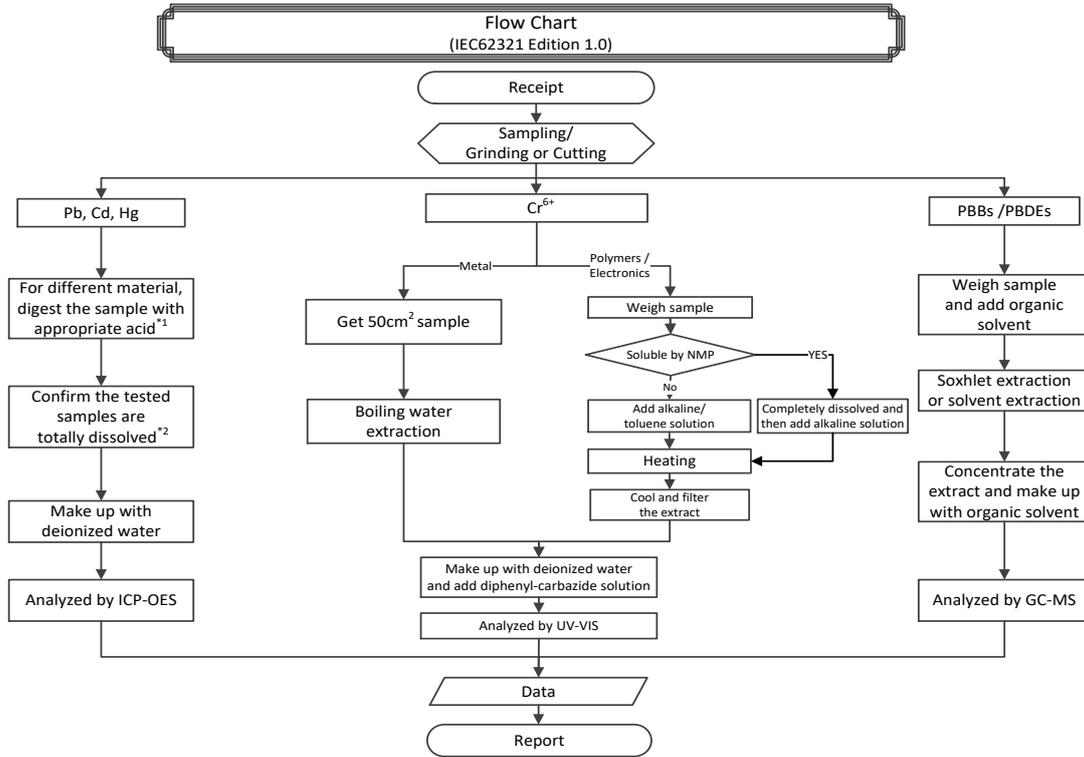
발행면수 (PAGE) : 6 of 11

발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)



Remarks :

*1 : List of appropriate acid :

| Material | Acid added for digestion |
|------------------|--|
| Polymers | HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃ |
| Substrate (BGA)s | HNO ₃ , HCl, HF |
| Electronics | HNO ₃ , HCl, H ₂ O ₂ , HBF ₄ |

*2 : The samples were dissolved totally by pre-conditioning method according to above flow chart.

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TEST REPORT (시험 성적서)

발행면수 (PAGE) : 7 of 11

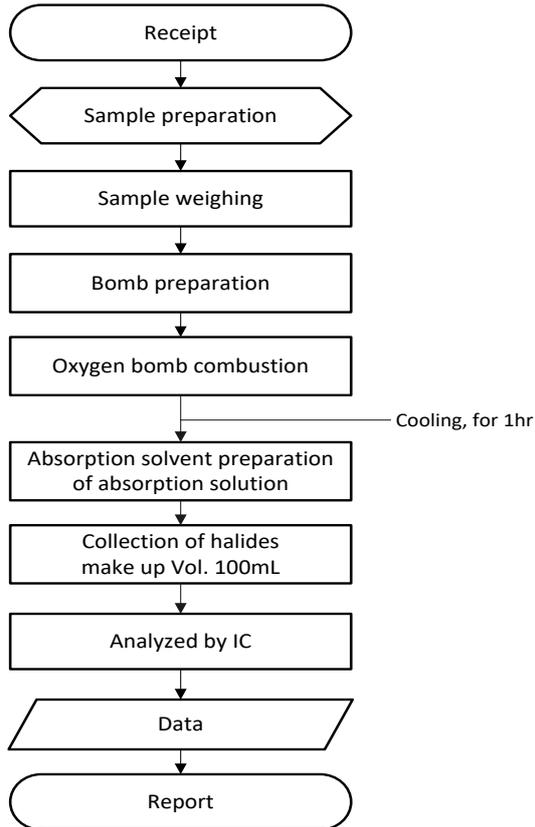
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시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

Flow Chart (EN14582)



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TEST REPORT (시험 성적서)

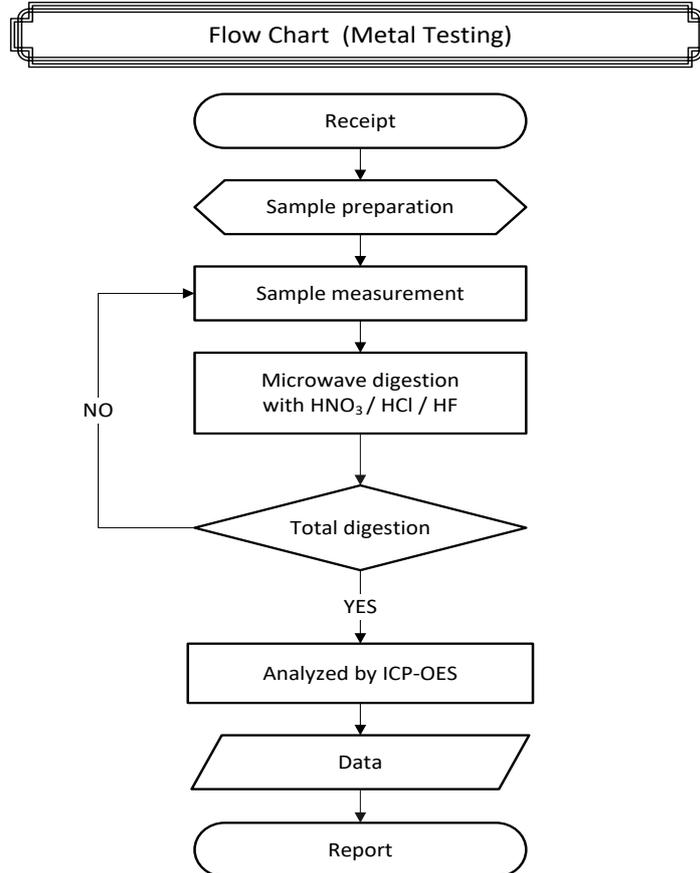
발행면수 (PAGE) : 8 of 11

발행일자 (DATE) : 2025. 03. 17.

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시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)



** 비고 : 이 샘플은 위의 흐름도에 따른 전처리 방법에 의해 완전용해 되었음.
(The samples were dissolved totally by pre-conditioning method according to above flow chart.)



TEST REPORT (시험 성적서)

발행면수 (PAGE) : 9 of 11

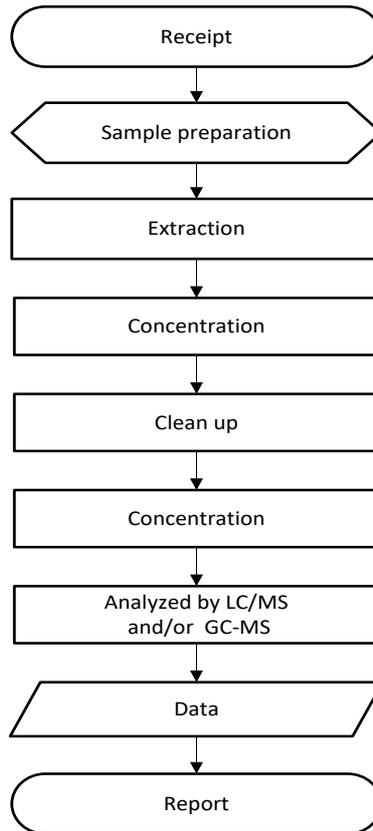
발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

Flow Chart (HBCDD)



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TEST REPORT (시험 성적서)

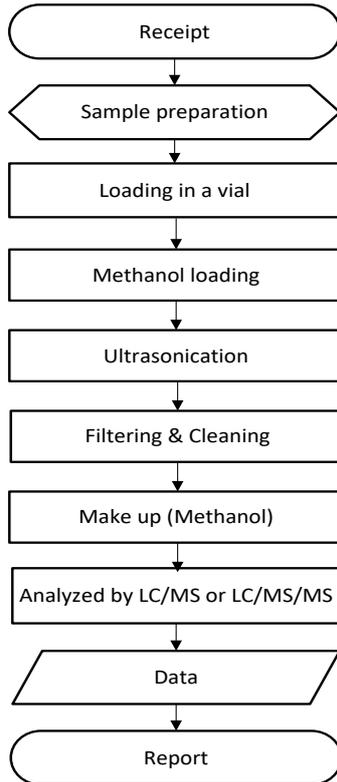
발행면수 (PAGE) : 10 of 11
발행일자 (DATE) : 2025. 03. 17.

시험성적서 번호 (REPORT NO.) : RT25R-S1841-001-K

시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

Flow Chart (PFOS, PFOA)



TEST REPORT

(시험성적서)

발행면수 (PAGE) : 11 of 11

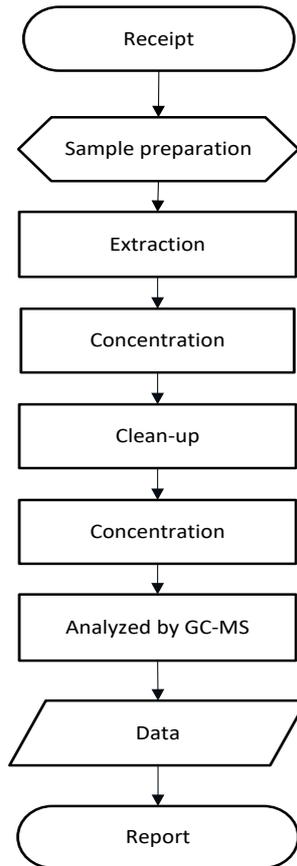
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시료고유번호 (SAMPLE ID NO.) : RT25R-S1841-001

시료명 (SAMPLE DESCRIPTION) : Ni Plating
(Ni Plating)

Flow Chart (Phthalates)



***** End of Report *****

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