

TEST REPORT

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Report No: AR-23-SV-051270-01
Customer: ROKKO LEADFRAMES PTE. LTD.
Date of Issue: 07/12/2023
JB Ref: 156-2023-11001195



Batch No: EUMYBM-00154248
Sample No: 138-2023-11005429

To: ROKKO LEADFRAMES PTE. LTD.
27, Tuas Ave 2
639458
SINGAPORE

Attn: Ms. Anu. K. Gopalan

Date Sample Received: 24/11/2023
Date of Testing: 01/12/2023 to 06/12/2023

The following sample was identified by the customer as :
Ag PLATED LF (BM C194)

Client Sample Code: 156-2023-11001195

Objective (s):

1. Determination of Cadmium (Cd), Hexavalent Chromium (Cr6+), Lead (Pb), Mercury (Hg), Polybrominated Biphenyl (PBBs), Polybrominated Diphenyl Ether (PBDEs), Phthalate (BBP, DBP, DEHP, DIBP) with RoHS Directive 2011/65/EU and (EU)2015/863 (amendment in Annex II).
2. Determination of Phthalates, Dimethyl Fumarate (DMF) and Hexabromocyclododecane (HBCDD) for above sample.
3. Determination of Bromine (Br), Fluorine (F), Iodine (I), Screening of PFOA (as F), Screening of PFOS (as F) and Screening of SCCP, PCBs, PCN & PCT (as Cl) for above sample.

Conclusion :

Test(s) Required	Compliance with Objective(s)
Cadmium (Cd), Lead (Pb), Mercury (Hg), Hexavalent Chromium (Cr6+), Monobromobiphenyl, Dibromobiphenyls, Tribromo biphenyls, Tetrabromo biphenyls, Pentabromo biphenyls, Hexabromo biphenyls, Heptabromobiphenyl, Octabromo biphenyls, Nonabromo biphenyls, Decabromo biphenyls, SumPolybrominated Biphenyls (PBB), Monobromodiphenyl ether, Dibromodiphenylether, Tribromo diphenylethers, Tetrabromo diphenyl ethers, Pentabromodiphenyl ether, Hexabromo diphenyl ethers, Heptabromodiphenyl ethers, Octabromo diphenyl ethers, Nonabromo diphenyl ethers, Decabromo diphenyl ethers, SumPolybrominated Diphenyl Ether (PBDE), Benzyl butyl phthalate (BBP), Bis(2-ethylhexyl)phthalate (DEHP), Dibutyl phthalate (DBP), Di-isobutyl phthalate (DiBP)	Comply
Dihexyl phthalate (DHXP), Diisodecyl phthalate (DIDP), Diisononyl phthalate (DINP), Di-n-octylphthalate (DNOP), Bis(2-methoxyethyl) phthalate (DMEP), DiisoHeptylphthalate (DiHP), Dimethyl Fumarate (DMF), Hexabromocyclododecane (HBCDD)	-
Bromine (Br), Fluorine (F), Iodine (I), Screening of PFOA (as F), Screening of PFOS (as F), Screening of SCCP, PCBs, PCN & PCT (as Cl)	-

Test Result(s):

Analysis	Industrial Products Analysis	Unit	Result	LOQ	Test Method	Specification
SVK51	Cadmium (Cd)	mg/kg	<LOQ	1	IEC 62321-5:2013	≤100mg/kg
SVL03	Lead (Pb)	mg/kg	<LOQ	10	IEC 62321-5:2013	≤1000mg/kg
SVK82	Mercury (Hg)	mg/kg	<LOQ	5	IEC 62321-4:2013	≤1000mg/kg
SVK66	Hexavalent Chromium (Cr6+)	-	negative	-	IEC 62321-7-1:2015	≤1000mg/kg (Refer Note 2)
SVK16	Polybrominated Biphenyl (PBBs)				IEC 62321-6:2015	
	Monobromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Dibromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Tribromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Tetrabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Pentabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3

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Analysis	Industrial Products Analysis	Unit	Result	LOQ	Test Method	Specification
	Hexabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Heptabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Octabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Nonabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Decabromo biphenyl	mg/kg	<LOQ	20		Refer Note 3
	Sum Polybrominated Biphenyls (PBBs)	mg/kg	<LOQ	20		≤1000mg/kg
SVK17	Polybrominated Diphenyl Ether (PBDEs)				IEC 62321-6:2015	
	Monobromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Dibromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Tribromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Tetrabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Pentabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Hexabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Heptabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Octabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Nonabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Decabromo diphenyl ether	mg/kg	<LOQ	20		Refer Note 3
	Sum Polybrominated Diphenyl Ethers (PBDEs)	mg/kg	<LOQ	20		≤1000mg/kg
SVT99	Phthalate (DEHP, BBP, DBP & DIBP)				In-House Method based on USEPA 3540C, GC-MS SOP-TM.ORG.012	
	Benzyl butyl phthalate (BBP)	% (w/w)	<LOQ	0.01		≤0.1%
	Bis(2-ethylhexyl)phthalate (DEHP)	% (w/w)	<LOQ	0.01		≤0.1%
	Dibutyl phthalate (DBP)	% (w/w)	<LOQ	0.01		≤0.1%
	Di-isobutyl phthalate (DiBP)	% (w/w)	<LOQ	0.01		≤0.1%
SVK12	Phthalate				In-House Method based on USEPA 3540C, GC-MS EUBM.SOP.TM.IP.26	
	Dihexyl phthalate (DHXP)	% (w/w)	<LOQ	0.01		-
	Diisodecyl phthalate (DIDP)	% (w/w)	<LOQ	0.02		-
	Diisononyl phthalate (DINP)	% (w/w)	<LOQ	0.02		-
	Di-n-octylphthalate (DNOP)	% (w/w)	<LOQ	0.01		-
SV03F	◆ Bis(2-methoxyethyl) phthalate (DMEP)	% (w/w)	<LOQ	0.01	In-House Method based on USEPA 3540C, GC-MS	-
SV03B	◆ DiisoHeptylphthalate (DiHP)	% (w/w)	<LOQ	0.01	In-House Method based on USEPA 3540C, GC-MS	-
SVM47	◆ Dimethyl Fumarate (DMF)	mg/kg	<LOQ	5	In-house Method, GC-MS	-
SVM48	◆ Hexabromocyclododecane (HBCDD)	mg/kg	<LOQ	5	In-house Method, GC-MS	-

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Date of Issue: 07/12/2023
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Batch No: EUMYBM-00154248
Sample No: 138-2023-11005429

Analysis	Industrial Products Analysis	Unit	Result	LOQ	Test Method	Specification
SVL43	Bromine (Br)	mg/kg	<LOQ	50	BS EN 14582:2016 (Calorimetric Bomb/Ion Chromatography)	-
SVL53	Fluorine (F)	mg/kg	<LOQ	50	BS EN 14582:2016 (Calorimetric Bomb/Ion Chromatography)	-
SVL51	Iodine (I)	mg/kg	<LOQ	50	BS EN 14582:2016 (Calorimetric Bomb/Ion Chromatography)	-
SVL56	Screening of PFOA (as F)	mg/kg	<LOQ	50	BS EN 14582:2016 (Calorimetric Bomb/Ion Chromatography)	-
SVL57	Screening of PFOS (as F)	mg/kg	<LOQ	50	BS EN 14582:2016 (Calorimetric Bomb/Ion Chromatography)	-
SVL44	Screening of SCCP, PCBs, PCN & PCT (as Cl)	mg/kg	<LOQ	50	BS EN 14582:2016 (Calorimetric Bomb/Ion Chromatography)	-

Specification Note

- RoHS Directive 2011/65/EU and (EU) 2015/863 (amendment in Annex II)
- Expression result for Hexavalent Chromium
 - Concentration of Hexavalent chromium ($<0.10 \mu\text{g}/\text{cm}^2$) = Negative (sample coating is considered a non-Cr(VI) based coating)
 - Concentration of Hexavalent chromium ($\geq 0.10 \mu\text{g}/\text{cm}^2$ and $\leq 0.13 \mu\text{g}/\text{cm}^2$) = Inconclusive (unavoidable coating variations may influence the determination)
 - Concentration of Hexavalent chromium ($>0.13 \mu\text{g}/\text{cm}^2$) = Positive (sample coating is considered to contain Cr(VI))
- Based on sum amount of PBB/PBDE limit, which is $\leq 1000\text{mg}/\text{kg}$

Remark

- The test portion was totally dissolved for cadmium, lead & mercury test by using pre-conditioning method as mentioned above.
- IEC 62321 flowchart can be obtained from <https://cdnmedia.eurofins.com/apac/media/606192/efctm001-issue-2.pdf>
- USEPA 3540C/GC-MS Flowchart can be obtained <https://cdnmedia.eurofins.com/apac/media/601323/efctm005issue01.pdf>
- BS EN 14582:2016 flowchart can be obtained from <https://cdnmedia.eurofins.com/apac/media/21871024/efctm003-issue-2.pdf>

This 4 page(s) of report and its attachment(s), if relevant, has/have been validated by



ChM. Sheue Fen Ong, B. Sc (Hons) Industrial Chemistry
IKM Registered Chemist
Registered No.:M/2864/5629/09

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Date of Issue: 07/12/2023
JB Ref: 156-2023-11001195



Batch No: EUMYBM-00154248
Sample No: 138-2023-11005429

EXPLANATORY NOTE

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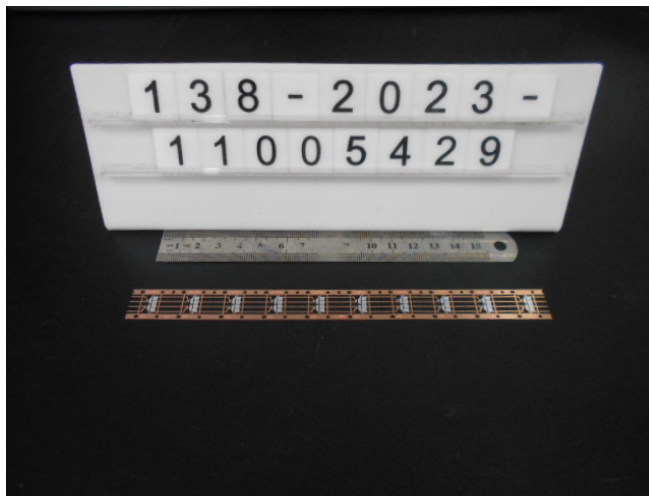
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N/A means not applicable.

<LOD means not detected at or below the Limit of Detection (LOD).

<LOQ means below the Limit of Quantification (LOQ)

Sample Photograph



- End of Report -

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Report No: AR-23-SV-050295-01
Customer: ROKKO LEADFRAMES PTE. LTD.
Date of Issue: 30/11/2023
JB Ref: 156-2023-11001198



Batch No: EUMYBM-00154250
Sample No: 138-2023-11005432

To: ROKKO LEADFRAMES PTE. LTD.
27, Tuas Ave 2
639458
SINGAPORE

Attn: Ms. Anu. K. Gopalan

Date Sample Received: 24/11/2023
Date of Testing: 27/11/2023 to 30/11/2023

The following sample was identified by the customer as :

Ag PLATED LF (BM C194)

Client Sample Code: 156-2023-11001198

Test Result(s):

Analysis	Failure Analysis	Unit	Result	Test Method
SV897	Material Identification by FTIR	-	Done	ASTM E 1252-98

Remark:

1. Refer attached report bearing the same report number for study outcome.

This 1 page(s) of report and its attachment(s), if relevant, has/have been validated by

ChM. Loh Pei Zhen, M. Sc. in Chemical Sciences
IKM Registered Chemist
Registered No.:M/5997/9603/22

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- Test result is externally provided outside Eurofins group but is not accredited

N/A means not applicable.

<LOQ means below the Limit of Quantification (LOQ)

<LOD means not detected at or below the Limit of Detection (LOD).

Result <value means below the Limit of Quantification (<LOQ).

* means test result exceeded specification.

- End of Report -

TEST REPORT

Report No : AR-23-SV-050295-01
Customer : ROKKO LEADFRAMES PTE. LTD.
Sample No(s) : 138-2023-11005432

Date of Issue : 30/11/2023
Batch No. : EUMYBM-00154250

To: ROKKO LEADFRAMES PTE. LTD.
27, Tuas Ave 2,
639458, Singapore.

Attn: Ms. Anu. K. Gopalan

The following sample(s) was(were) identified by the customer as:
Ag PLATED LF (BM C194)

Date of Sample Received : 24/11/2023
Date of Testing : 27/11/2023 to 30/11/2023

Objective(s)

To detect for the presence of PVC on sample received using Fourier Transform Infrared Spectroscopy (FTIR).

Test Procedure(s)

Selected area on sample received was scrapped with a cleaned pen-knife. The scrapped specimen was mixed and ground with KBr powder then made into a pellet of 13mm in diameter using a die set before scanned directly by transmission mode of FTIR (Perkin Elmer Spectrum 100) as per ASTM Method E 1252-98.

Conclusion(s)

It is uncertain if the Ag Plated LF (BM C194) contains PVC.

Remark(s):

- This test report can only be reproduced in full together with its test report cover page bearing the same report number.
- Kindly refer to cover page for test accreditation details.
- Generally, two FTIR spectra are considered comparable when their spectra matching percentage is at least 95%.

This test report has been validated by



ChM. Loh Pei Zhen, M. Sc. in Chemical Sciences
IKM Registered Chemist
Registered No.:M/5997/9603/22

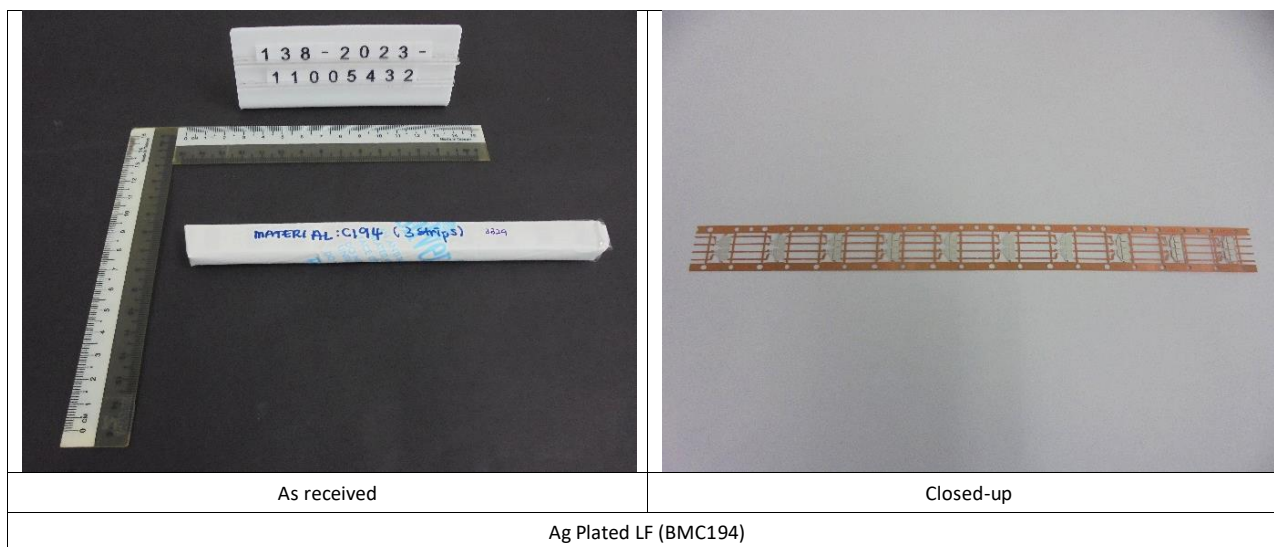
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Report No : AR-23-SV-050295-01
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 Sample No(s) : 138-2023-11005432

Date of Issue : 30/11/2023
 Batch No. : EUMYBM-00154250

Sample Photograph(s)



Test Result(s)

Table 1: Comparison of FTIR Spectra between selected areas on Ag Plated LF (BM C194) with PVC from FTIR library.

Spectra Comparison	Matching Percentage (%)
Ag Plated LF (BM C194) vs. PVC	7.58

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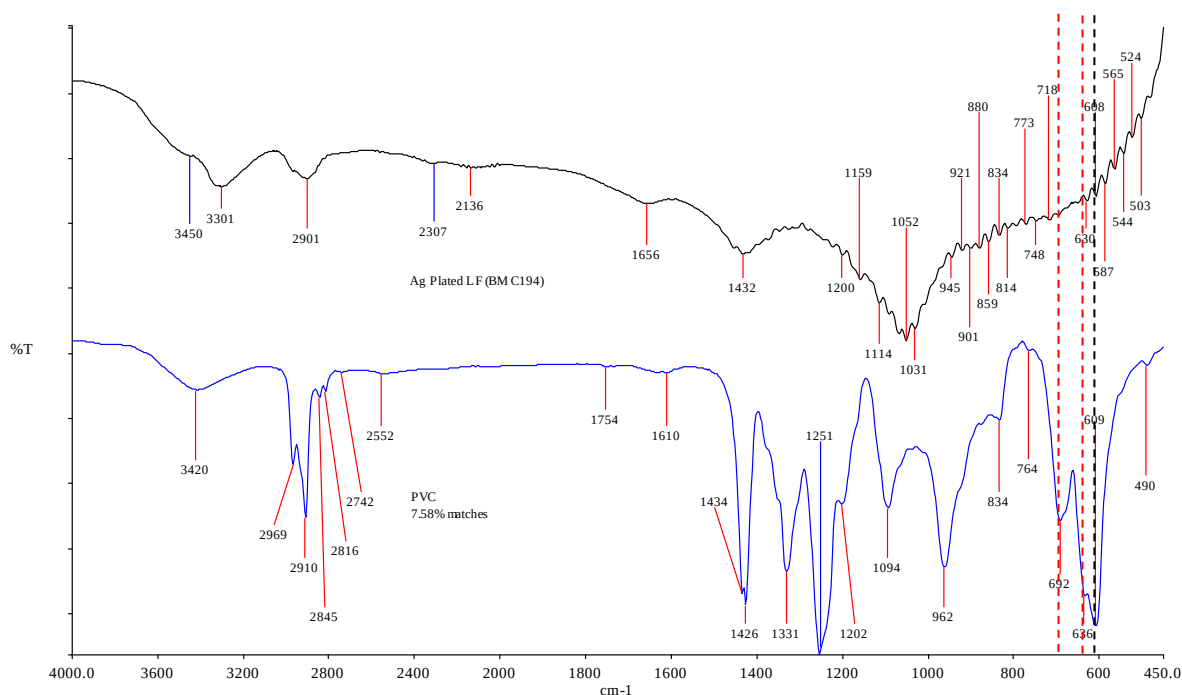
Report No : AR-23-SV-050295-01
Customer : ROKKO LEADFRAMES PTE. LTD.
Sample No(s) : 138-2023-11005432

Date of Issue : 30/11/2023
Batch No. : EUMYBM-00154250

Comment(s)

It is uncertain if the Ag Plated LF (BM C194) contains PVC suggested based on the following observations. However, their spectra dissimilarities and low spectra matching percentage at 7.58% suggests the Ag Plated LF (BM C194) is not PVC.

- 1 major peak assignable to PVC (indicated by black-dashed line) was observed in the spectrum of Ag Plated LF (BM C194) at 608 cm^{-1} .
- Masking effect of the remaining typical peaks of PVC at 692 cm^{-1} and 636 cm^{-1} (indicated by red-dashed lines) are to be identified. Thus, the confirmation of the presence of these peaks are not possible.



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Raw Data:

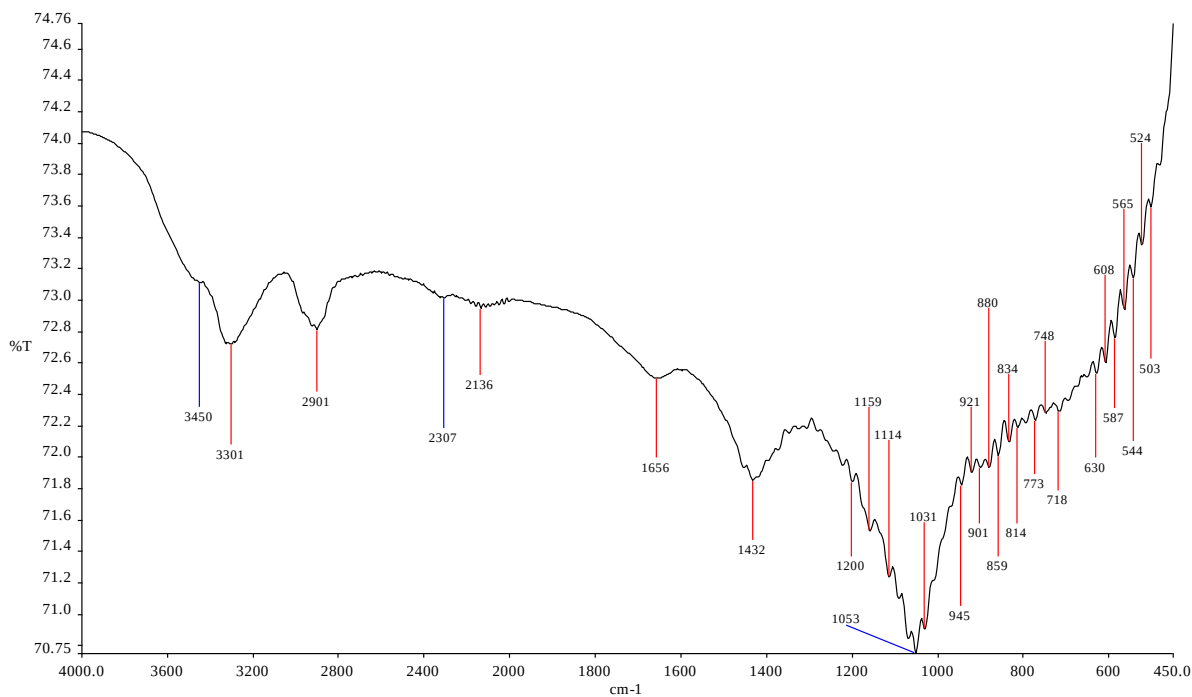


Figure RD1: FTIR spectrum of Ag Plated LF (BM C194) – KBr

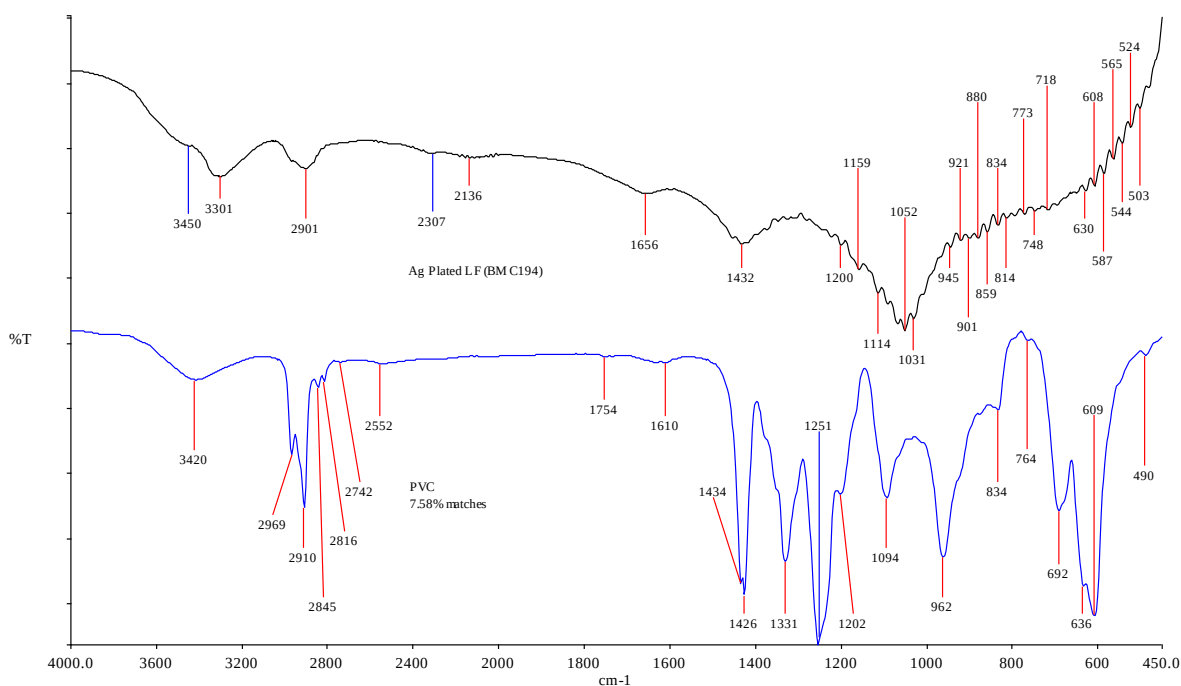


Figure RD2: Comparison FTIR spectrum of Ag Plated LF (BM C194) with PVC
– End of Report –