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ECSS-Q-70-02A
Thermal vacuum outgassing test for the screening of space materials

Syfer FlexiCap™ Surface Mount Capacitor Test Results

Introduction

This application note is primarily aimed at Space customers to provide outgassing test data conducted in accordance with ECSS-Q-70-02A on Syfer's FlexiCap™ termination material.

FlexiCap™ termination is a proven material that withstands greater levels of mechanical stress when compared with conventional sintered termination. For example, mechanical stress induced by PCB flex or temperature cycling.

FlexiCap™ is a silver loaded epoxy polymer that is applied onto the ceramic body of the component using conventional termination techniques. After the termination process stage the capacitors are plated with Nickel and Tin or Tin/Lead using the same methods as for the sintered Silver terminated capacitors.

Many customers have recognized the benefits provided and have approved FlexiCap™ for applications including high reliability requirements such as automotive, military and aerospace.

For qualification tests conducted on FlexiCap™ terminated capacitors refer to Syfer application notes:

- AN0001 available at www.syfer.com/category_docs/AN0001_PolymerTermination.pdf . This application note provides details on the FlexiCap™ material, qualification tests conducted and also comparative data with sintered termination.
- AN0009 available at www.syfer.com/doc_docs/AN0009_AEC-Q200_Qualification_for_Passive_Components.pdf . This application note provides details on the rigorous AEC-Q200 automotive stress test requirements conducted on X7R capacitors terminated with FlexiCap™.

Test Laboratory

The test report provided in appendix 1 has been prepared by Intespace located in Toulouse, France. Intespace is a leading laboratory conducting all types of environmental testing including Space applications. Further information is available at www.intespace.fr .

The customer information stated on the first page of the Intespace report refers to Alter Technology Group. The reason for this is that Syfer supplied the material to Alter who then subcontracted the outgassing test to be conducted by Intespace.

Test Report Abbreviated Terms

- CVCM: Collected Volatile Condensable Material
- RML: Recovered Mass Loss
- TML: Total Mass Loss
- WVR: Water Vapour Regained

ECSS-Q-70-02A Acceptance Limits

The following limits are defined in ECSS-Q-70-02A as general acceptance limits. Note: The acceptance limits for materials that are used in the fabrication of optical devices or in the vicinity of optical devices may be more stringent than the general limits stated.

- RML: < 1.0 %
- CVCM: < 0.10 %

Report Summary

Section 7 titled Results in the report issued by Intespace test laboratory confirms that FlexiCap™ termination material is in compliance with ECSS-Q-70-02A.

Ordering Information

Part Number Construction

Example: 1210H1000103JXT□□□

1210	H	100	0103	J	X	T	□□□
Chip Size	**Termination**	**Voltage d.c. (marking code)**	**Capacitance in Pico farads (pF)**	**Capacitance Tolerance**	**Dielectric Codes**	**Packaging**	**Suffix Code**
0603 **0805** **1206** **1210** **1808** **1812** **1825** **2220** **2225** **3640** **5550** **8060**	**Y** = FlexiCap™ termination base with nickel barrier (100% matte tin plating). RoHS compliant. **H** = FlexiCap™ termination base with nickel barrier (tin/lead plating with min. 10% lead). Not RoHS compliant.	**010** = 10V **016** = 16V **025** = 25V **050** = 50V **063** = 63V **100** = 100V **200** = 200V **250** = 250V **500** = 500V **630** = 630V **1K0** = 1kV **1K2** =1.2kV **1K5** =1.5kV **2K0** = 2kV **2K5** =2.5kV **3K0** =3kV **4K0** =4kV **5K0** =5kV **6K0** =6kV **8K0** =8kV **10K** =10kV **12K** =12kV	<1.0pF Insert a P for the decimal point as the first character. e.g., **P300** = 0.3pF Values in 0.1pF steps ≥1.0pF & <10pF Insert a P for the decimal point as the second character. e.g., **8P20** = 8.2pF Values are E24 series ≥10pF First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is the number of zeros following. e.g., **0101** = 100 pF Values are E12 series	**H**: ± 0.05pF (only available for values <4.7pF) <10pF **B**: ± 0.10pF **C**: ± 0.25pF **D**: ± 0.5pF **F**: ± 1.0pF ≥10pF **F**: ± 1% **G**: ± 2% **J**: ± 5% **K**: ± 10% **M**: ± 20%	**A** = C0G (1B/NP0 AEC-Q200 qualified) **C** = C0G (1B/NP0 standard components) **D** = X7R (2R1 with IECQ-CECC release) **E** = X7R (2R1 AEC-Q200 qualified) **F** = C0G (1B/NP0 with IECQ-CECC release) (1B) **X** = X7R (2R1 standard components) (2R1) **P** = X5R	**T** = 178mm (7") reel **R** = 330mm (13") reel **B** = Bulk pack – tubs or trays **Q** = Waffle pack	Used for specific customer requirements

For Space applications, Syfer supplies components to Syfer Detail Specification reference S02A 0100. This specification has been generated in accordance with ESCC Generic Specification 3009 and corresponding ESCC component detail specifications.

For further information contact Syfer Sales at sales@syfer.co.uk

Appendix 1 – Test Laboratory Report

REPORT Issue 2		Number of pages : 13
INTESPACE Reference M9019	Customer Reference	DQI METROLOGY

Subject
DEGASSING RESULTS OF 3 MATERIALS

Type(s)
☐ Contamination ☐ Temperature ☑ Degassing results ☐ Pressure ☐ Mesures Thermo-Optiques

Material
ALUMINA BLANKS-FLEXICAP (123)- FLEXICAP (112)

	Name	Date	Signature
Author	J.RADILIMANANTSOA	14/08/08	P.I. F.PIERUCCIONI
Quality Control	F.CHICOT (A. LOUIT	14/08/2008	

Addressees	Customer (Name & Address) : M R. BUCKLEY ALTER TECNOLOGY GROUP –AEROSPACE & DEFENCE Waterside House, Waterside Gardens Fareham,Hampshire PO16 8RR United Kingdom INTESPACE : 1 ex

2 rond point Pierre Guillaumat - BP 64356 - 31029 TOULOUSE CEDEX 4 - FRANCE - Tél. +33 (0) 5 61 28 11 11 - Fax +33 (0) 5 61 28 11 12 - www.intespace.fr - marketing@intespace.fr

S A au capital de 3 904 560 Euros - R C S TOULOUSE B 326 100 971 - SIRET 326 100 971 00018 - APE 7120 B - TVA : FR16326100971

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APPENDICES

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1. GENERAL INFORMATION

1.1 CUSTOMER

Name : M R. BUCKLEY
Company : ALTER TECHNOLOGY GROUP-AEROSPACE&DEFENCE
Organism :
Service :

1.2 RESPONSIBLES PRESENT

Customer :
For INTESPACE : M. J.RADILIMANANTSOA

1.3 DATES

Test demand : 23/04/08
Material arrival : 30/04/08
Start of test : 07/07/08
End of test : 11/07/08

2. DOCUMENTATION

Applicable documentation :
Qualification of Materials according to Specification ECSS-Q-70-02A of May 26, 2000 :
Alumina blanks, Flexica 123, Flexicap 112

3. PURPOSE OF THE TEST

Characterize the materials with respect to the Specification ECSS-Q-70-02A.

4. TEST FACILITY

INTESPACE Test Bench for micro VCM degassing.

5. TEST SPECIFICATION

The results, in Identification Card form, are given with the following criterion :
RML < 1% of the sample mass
CVCM < 0.1% of the sample mass

6. TEST PROGRESS

In compliance with Standard ECSS-Q-70-02A of May 26, 2000.

7. RESULTS

MATERIAL	MANUFACTURER	CONFORMITY TO ECSS-Q-70-02A STANDARD
Alumina blanks	SYFER	IN COMPLIANCE WITH THE SPECIFICATION ECSS-Q-70-02A
Flexicap123	SYFER	IN COMPLIANCE WITH THE SPECIFICATION ECSS-Q-70-02A
Flexicap 112	SYFER	IN COMPLIANCE WITH THE SPECIFICATION ECSS-Q-70-02A

8. IDENTIFICATION CARDS

MATERIAL :

Identification Card : ITS 08/28/35				
MATERIAL	TML in %	RML in %	CVCM in %	WVR in %
Alumina Blanks	0.02	0.00	0.00	0.02
	0.01	0.00	0.00	0.01
	0.01	0.00	0.00	0.01
AVERAGE	0.01	0.00	0.00	0.01

MATERIAL :

Identification Card : ITS 08/28/36				
MATERIAL	TML in %	RML in %	CVCM in %	WVR in %
Flexicap 123	0.18	0.09	0.00	0.09
	0.18	0.11	0.00	0.08
	0.18	0.10	0.00	0.08
AVERAGE	0.18	0.10	0.00	0.08

MATERIAL :

Identification Card : ITS 08/28/37				
MATERIAL	TML in %	RML in %	CVCM in %	WVR in %
Fexicap 112	0.16	0.08	0.00	0.09
	0.12	0.08	0.00	0.04
	0.18	0.10	0.00	0.08
AVERAGE	0.15	0.08	0.00	0.07

9. ANALYZE SPECTRES

9.1. DOCUMENTATION

For the analysis of contamination, use of the procedures 22 / AP / QA-f and 151 / AP / QA-f.

9.2. EQUIPMENT USES FOR ANALYSES

For analyses, equipment which was used is the following one:

- Type : Infrared Spectrophotometer
- Fabricant : PERKIN ELMER
- Model : SPECTRUM ONE
- S/N : 70961
- Range : 2 à 25 µm
- Last calibration : February 2005

9.3. OBJECTIVES

The spectral analyses of type aim at considering the various contaminants deposited on condensers, at the end of a **µvcm** try.

9.4. SUMMARY OF THE RESULTS

For the interpretation of the results, we applied the procedure referenced :

- *«ESA PSS-1-705 Issue 1 »*

We have only background noises, what is explained by the fact of the absence of condensable deposits in CVCM.
The 3 characteristic spectres are joined in appendix 2. Our analysis is purely qualitative.
We watch specialy the presence of peaks following the standard ESA to know the peak 2925cm-1 (Hydrocarbons) 1735cm-1 (Esters), 1260cm-1 (Methyl-Silicon), and 1120cm-1 (Phényl-Silicon).

APPENDIX 1

IDENTIFICATION CARDS

Material Identification Card

N° = ITS 08/28/35

Description and history of samples	a) alumina blanks	b)		
a) Trade name and Number				
b) Manufacturer	c)	d)		
c) Type of product				
d) Chemical nature	e)			
e) Processing détails				
e.g. -joining method				
- heat treatment				
- cure and post cure				
- cleaning method				
- relevant spec N°				
Batch number:		Material density :	Unknown	
Sample quantity :		Substrat density :		
Preparation date :		Subtrat material :	Aluminia	
Prepared by :	Sean England			
Firm :	**SYFER**	Project manager	Mr John Shreeve	
Sample code (refer to the DML item number of the project)		or originator name	Sean England	
		Section	Engineering	
Application :				
Test specification number	**ECSS - Q -70- 02 A 26 May 2000**	Quality control sample		**YES**
		Evaluation sample		
For materials and processes division use				
Date received :	30 juin 2008			
Responsable (Test House) :	**DQS**			
Test date :	7 juillet 2008			
Report number :	**M9019**			

Results :

	Avera.	1°sample	2°sample	3°sample
TML en %	**0,01**	0,02	0,01	0,01
RML en %	**0,00**	0,00	0,00	0,00
CVCM en %	**0,00**	0,00	0,00	0,00
WVR en %	**0,01**	0,02	0,01	0,01

Accept X **Reject**

Material Identification Card

N° = ITS 08/28/36

Description and history of sample	a) Flexicap	b) Syfer	
a) Trade name and Number			
b) Manufacturer			
c) Type of product	c) Adhesive termination	d) Silver loaded epoxy	
d) Chemical nature			
e) Processing détails	e) Wet material applied to Aluminia substrata		
e.g. -joining method	Dried at 180°C for 30 minutes Then further material added and dried to reach ~0,3g weight		
- heat treatment	All samples then subjected to cure at 180°C for 1 hour		
- cure and post cure			
- cleaning method			
- relevant spec N°			
Batch number:	123	Material density :	Unknown
Sample quantity :	2*3	Substrat density :	
Preparation date :	23,05,08	Subtrat material :	Aluminia
Prepared by :	Sean England		
Firm :	SYFER	Project manager	Mr John Shreeve
Sample code (refer to the DML item	ESTEC reservation	or originator name	Sean England
number of the project)	0	Section	Engineering
Application :			

Test specification number	ECSS - Q -70- 02 A	Quality control sample		
	26 May 2000	Evaluation sample		YES
For materials and processes division use	0			
Date received :	30 juin 2008			
Responsable (Test House) :	DQS			
Test date :	7 juillet 2008			
Report number :	M9019			

Results :	Avera.	1°sample	2°sample	3°sample
TML en %	0,18	0,18	0,18	0,18
RML en %	0,10	0,09	0,11	0,10
CVCM en %	0,00	0,00	0,00	0,00
WVR en %	0,08	0,09	0,08	0,08

Accept X Reject

Material Identification Card

N° = ITS 08/28/37

Description and history of sample	a) Flexicap	b) Syfer
a) Trade name and Number		
b) Manufacturer	c) Adhesive termination	d) Silver loaded epoxy
c) Type of product		
d) Chemical nature	e) Wet material applied to Aluminia substrata	
e) Processing détails	Dried at 180°C for 30 minutes Then further material added and dried to reach ~0.3g weight	
e.g. -joining method	All samples then subjected to cure at 180°C for 1 hour	
- heat treatment		
- cure and post cure		
- cleaning method		
- relevant spec N°		

Batch number:	112	Material density :	Unknown
Sample quantity :	2*3	Substrat density :	
Preparation date :	23.05.08	Subtrat material :	
Prepared by :	Sean England		
Firm :	**SYFER**	Project manager	Mr John Shreeve
Sample code (refer to the DML item number of the project)	ESTEC reservation 0	or originator name	Sean England
		Section	Engineering
Application :			

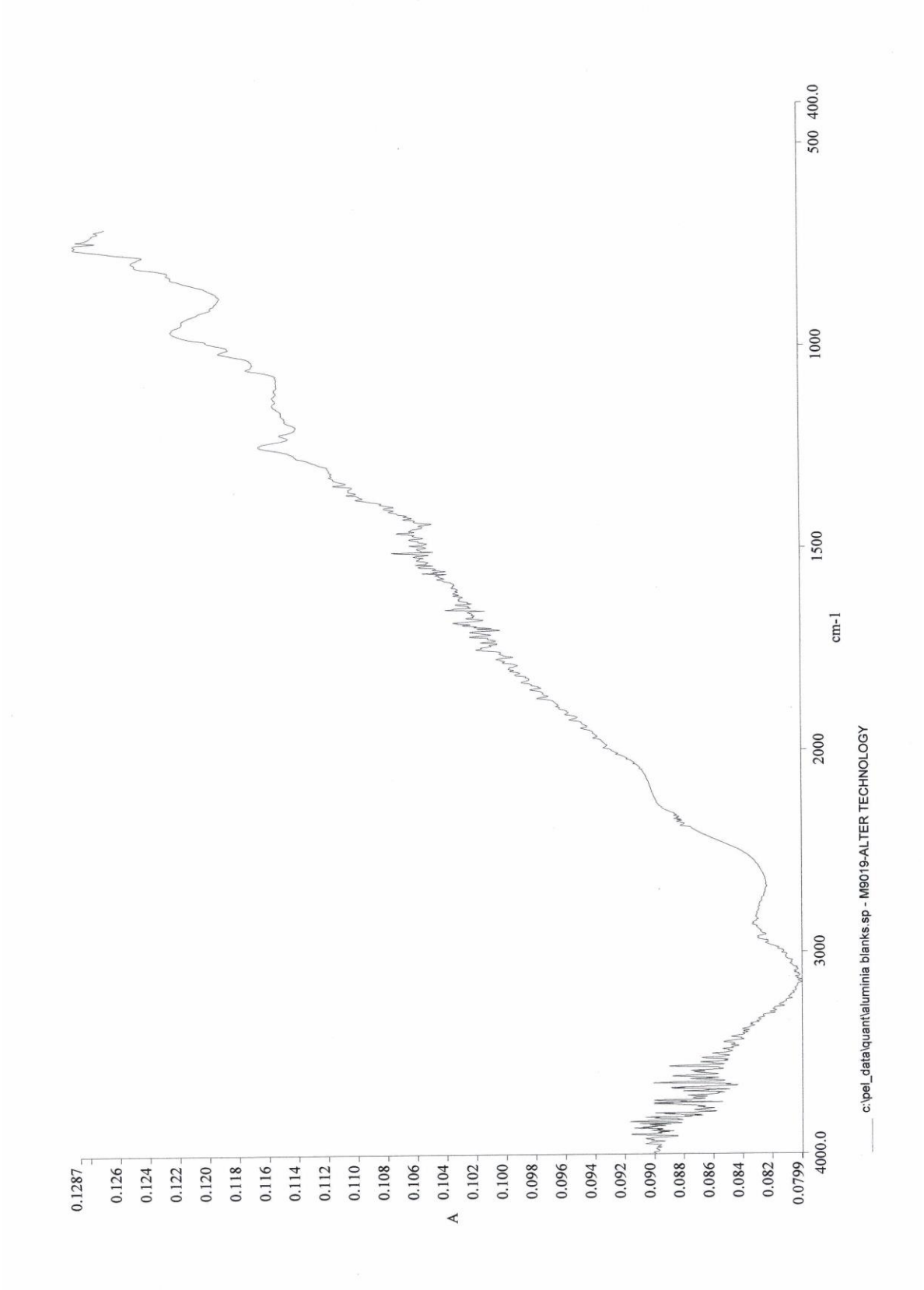
Test specification number	**ECSS - Q -70- 02 A**	Quality control sample		
	26 May 2000	Evaluation sample		**YES**
For materials and processes division use	0			

Date received :	30 juin 2008	**Results :**	**Avera.**	1°sample	2°sample	3°sample
		TML en %	**0,15**	0,16	0,12	0,18
Responsable (Test House) :	**DQS**	**RML en %**	**0,08**	0,08	0,08	0,10
		CVCM en %	**0,00**	0,00	0,00	0,00
Test date :	7 juillet 2008	**WVR en %**	**0,07**	0,09	0,04	0,08
Report number :	**M9019**	**Accept**	X	**Reject**		

intespace	**INTESPACE Reference M9019**	APPENDIX **2**

APPENDIX 2

SPECTRE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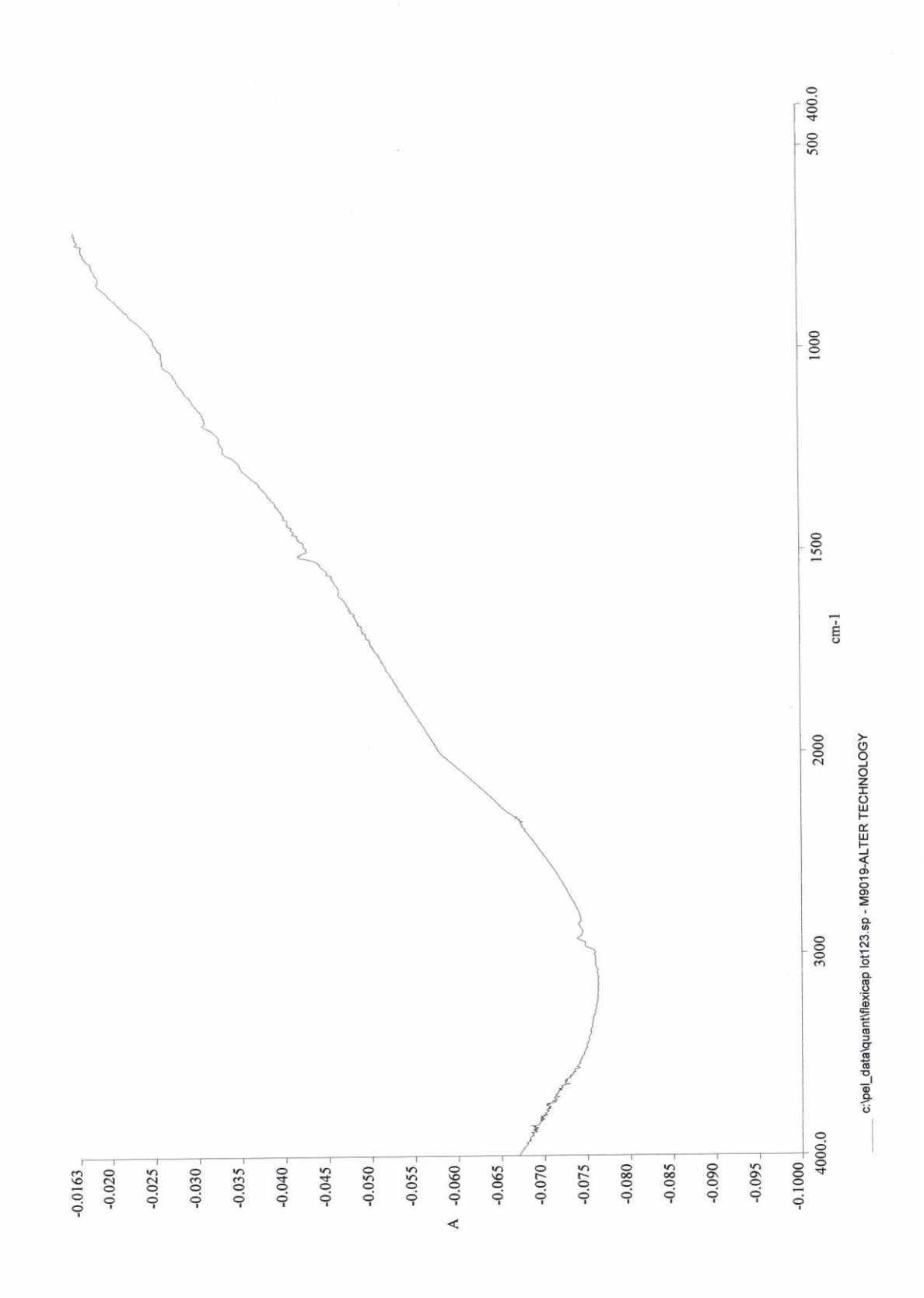
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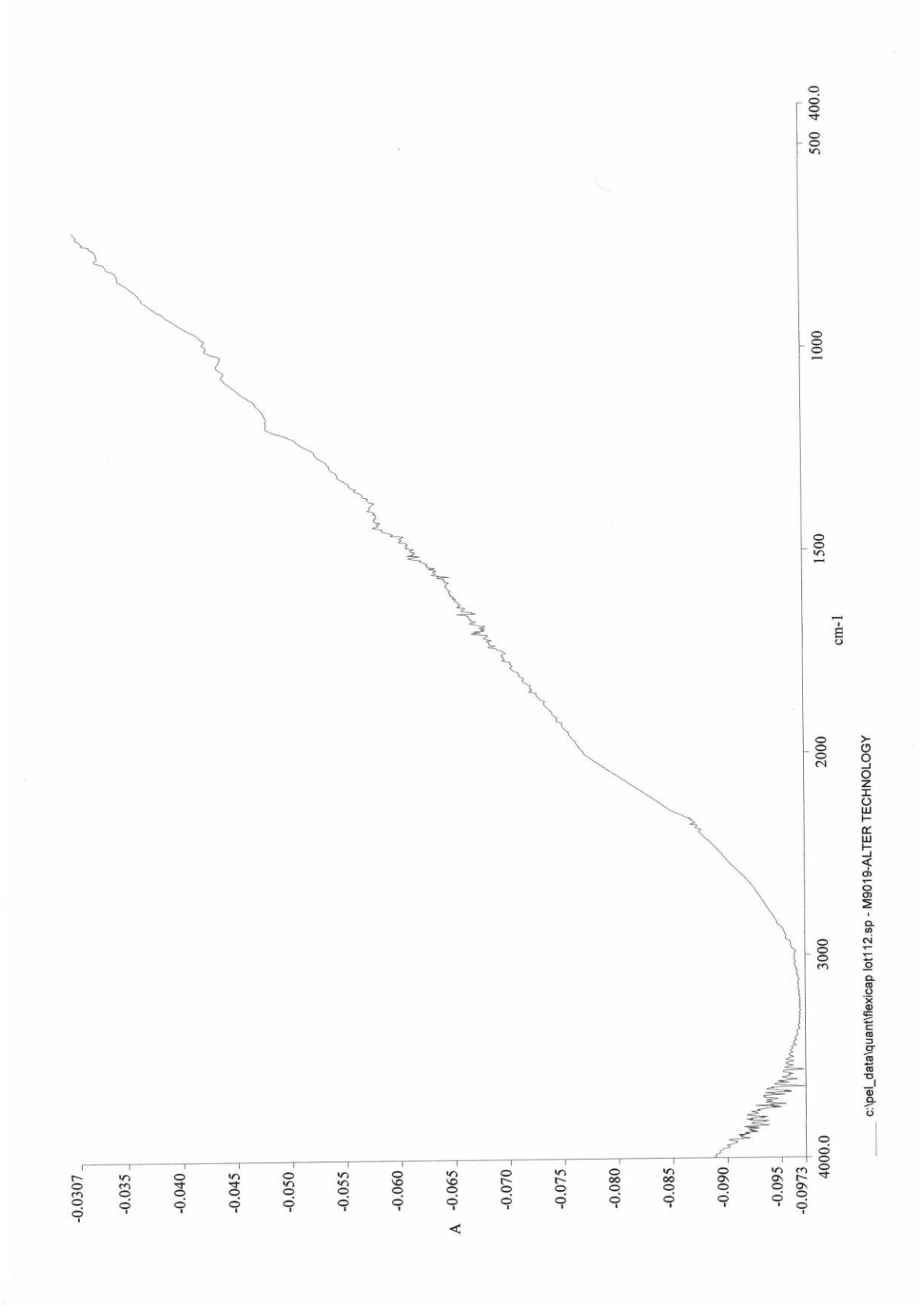
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