

**Declared Materials List**  
**Cardiff Deliverables for SPIRE-PFM**

SPIRE Ref.: SPIRE-UCF-PRJ-002153

Cardiff Ref.: HSO-CDF-LI-074

Issue: 1.0

1 October 2004

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Approved by:-	Ian Walker – Cardiff AIG programme manager		

# Update history

Date	Version	Remarks
20 <sup>th</sup> September 2004	1.0	

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## **SCOPE**

This document lists the declared materials used in the provision of the deliverables for the SPIRE-PFM and FS instrument from Cardiff University

## **INTRODUCTION**

Materials used by Cardiff University are listed in the accompanying tables, which are compliant with ESA: PSS-01-700 Issue 2. Each material has an individual identification number, the first digit being the group type as follows:-

1. Aluminium and Aluminium Alloys
2. Copper and Copper Alloys
3. Nickel and Nickel Alloys
4. Titanium and Titanium Alloys
5. Steels
6. Stainless Steels
7. Filler Metals: Welding, Brazing, and Soldering
8. Miscellaneous Metallic Materials
9. Optical Materials
10. Adhesives, Coatings, Varnishes
11. Adhesive Tapes
12. Paints and Inks
13. Lubricants
14. Potting Compounds, Sealants, Foams
15. Reinforced Plastics
16. Rubbers and Elastomers
17. Thermoplastics (Non Adhesive Tapes, Foils (MLI)....)
18. Thermoset Plastics
19. Wires and Cables (For Materials Aspects Only)
20. Miscellaneous Non-Metallic Materials (Ceramics....)

## **CONTENT OF THE DECLARED MATERIALS LIST**

Extract from ESA PSS -01-700 Issue 2 (August 1993) ANNEX B

The materials list consists of 10 columns, which shall be completed as indicated below. Furthermore, similar materials shall be grouped together as specified above. If a particular item does not apply, write N.A (Not Applicable).

### **COLUMN 1 : Item Number**

Identification number in each group. One only per material type. Does not change during the life of the material list (sub-items permitted when deemed necessary).

### **COLUMN 2 : Commercial Identification**

Trade name and number (to be completed in full) e.g. "ARALDITE AV 100".  
Correct and standard designation.

ESA has chosen:

Trade name + number. For example "ARALDITE AY 105"

If no trade name exists, then the manufacture's name plus number are entered: e.g. "SCHOTT BK7"

In the case of the AISI system for steel: for other metals or alloys, the main consistent will be entered first except in the case of a traditional name (e.g. brass or bronze).

For each material as designated above, a unique item number shall be given. If several lines are used for different applications and /or processing, sub item numbers shall be added.

### **COLUMN 3 : Chemical Nature And Type Of Product**

Example: epoxy resin, polyurethane adhesive, or Ti, 6Al, 4 alloy.

### **COLUMN 4 : Procurement Information**

Manufacturer/supplier: name of the manufacture and the name of the supplier if different.

Specification: reference of the procurement specification with, if considered useful, issue and revision. It may be replaced by a national specification number if it exists and make source of procurement irrelevant.

### **COLUMN 5 : Processing Parameters (Summary):**

Give as relevant: mixture proportions, cure temperature, special-cleaning agents, surface treatment, thermal treatment, temperature, etc.  
 NOTE: Specification number is required, but not sufficient for ESA purposes.

**COLUMN 6 : Use and Location**

Indicate in what subsystem, box or item the material is used and whether it acts as structural element, thermal control, electrical insulation etc. as relevant.

**COLUMN 7 : Environmental Code**

Radiation /UV/ATAXIA (1) (R)		Ambience ( A )	Temperature (2) ( T )
G = Geostationary L = Low Orbit B = Radiation Belts I = Interplanetary	S = Outside Shadow L = Outside Light	V = Vacuum H = Hermetic M = Manned E = Elevated Pressure	1 = 0 to 100 2 = 101 to 200K 3 = 201 to 300 K “ etc.

(1) For materials inside the spacecraft, choose a letter from the left-hand side column. For materials on the surface of the spacecraft, combined this letter with “L” or “S”.

(2) Thermal cycle to be indicated by two values, e.g. 3/5.

(3) “RT” can be accepted as a code between 238 K (10°C) and 313 K (40°C).

Materials which are at a boundary between environments shall be described by two sets of codes.

**COLUMN 8 : Size Code**

AREA	A (cm <sup>2</sup> )	0 = 0 < 1
VOLUME	V (cm <sup>3</sup> )	1 = 1 < 10
MASS	W (g)	2 = 10 < 100
		3 = 100 < 1000
		etc.....

Choose an alphanumeric combination from the above mentioned table, e.g. A5 or V2 or W3

**COLUMN 9** : All the codes of Column 9 shall be relevant for the project concerned, which implies that they refer to validated data applicable to this project (not too old, same processing, same composition, QC tests run on the same procured lot, etc.).  
Reference of test report and relevant test result code to be given in Subcolumn 9.1

**SUBCOLUMN 9.1 :**

Outgassing (OUT):

P - The material passed the Outgassing test detailed in [ECSS-Q-70-02A](#). Reference of test report to be given in Subcolumn 9.2.

F - The material failed. Waiver reference in Subcolumn 9.2.

U - Materials of which Outgassing characteristics are unknown.

Stress Corrosion Cracking (SCC):

A - The material is known to have a high resistance to SCC.

(Table I document [ECSS-Q-70-36A](#)).

B - Table II and III document [ECSS-Q-70-36A](#).

Justification for approval (test reference) stated in Subcolumn 9.2 (generally making reference to [ECSS-Q-70-36A](#)).

U - Materials and / or *weldments* for which SCC characteristics are unknown: A SCC evaluation form is required, based if necessary on tests (see [ECSS-Q-70-37A](#)).

Corrosion (Corr.):

A - The material does not require a surface treatment or coating for its intended application, otherwise it shall be rated B.

B - Details of the surface treatment to be given in Column 5.

Flammability (Flamm.) (If applicable):

P - The material passes the requirements of document [ECSS-Q-70-21A](#).

F - The material failed the test of document [ECSS-Q-70-21A](#) in the applicable atmosphere. Waiver reference in Subcolumn 9.2.

U - Materials of which offgassing characteristics are unknown.

Offgassing (OFF) (if applicable):

P - The material passes the requirements of document [ECSS-Q-70-29A](#).

F - The material failed: waiver reference in Subcolumn 9.2

U - Materials of which offgassing characteristics are unknown.

**SUBCOLUMN 9.2** : Justification for Approval

The purpose of this sub column is to enter any additional information that may be necessary in order to achieve customer approval. This information is reference of the Requests For Approval; reference of justificatory file for materials approved for other space or aeronautical programmes meeting the specific needs of the programme, reference of the evaluation report or waivers etc. These documents must be made available to ESA on request.

**SUBCOLUMN 9.3** : Approval Status of the Contractor

*A - Approved* = All materials classified "A" may be used without restriction.

*Y - Approved with restriction* = These materials require the preparation of QC test specimens or a treatment before use: potting, coating, test specimens...

*W - Approved with a waiver* = These materials do not meet the requirements but are used for functional reasons. The use of such materials shall be reduced to a minimum. All the waivers shall be approved by ESA. The waiver number shall be entered in Subcolumn 9.2.

*P - Pending a decision* = Materials for which an evaluation report or a waiver is awaiting the contractor's provisional or definitive approval.

*O - Open* = New materials or materials for which investigations and qualification are in progress.

*D - Deleted* = This clarification is used for a material, which is no longer used.

**COLUMN 10** : ESA approval and comments

This column will be completed by ESA in accordance with the standard comments list in Annex E.

**COLUMN 11** : ESA sign-off

**COLUMN 12** : Project sign-off



Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		1 Aluminium & aluminium alloys																
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
1-1	Aluminium alloy 6082	6082-T6 Commercial product. Extrusion / plate / rod	Metalfast Ltd, Swindon <a href="http://www.metalfast.co.uk">www.metalfast.co.uk</a> C of C# 187636 / 1 / 672545 187824 / 1 / 672972	Aluchrom 1200	300mK Photometer bus-bar supports. (LTS-PFM-100, LTS-PFM-200) 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W2							ISO9002		
			Orchard Materials Ltd, Unit 20, Cooper road, Thornbury industrial estate, Thornbury, Bristol BS35 3UW		Spectrometer calibration source SCAL-PFM-000 300mK filter clamps FILT-PFM-210, FILT-PFM-220, FILT-PFM-230, FILT-PFM-240, FILT-PFM-250	I	V	1	W3, W2							ISO9002		
			Aalco, test lane, Nursling, Southampton, SO16 9TA C of C# 0747194		Photometer calibration source PCAL-PFM-000	I	V	1	W1							ISO9000		



<b>Issue # 1</b>		<b>DECLARED MATERIALS LIST</b>										<b>HSO-CDF-LI-074</b>					
<b>Project:</b>		<b>Herschel-SPIRE</b>															
<b>Institute:</b>		<b>Cardiff University</b>															
<b>Prepared by:</b>		<b>Peter Hargrave</b>															
<b>Category:</b>		<b>3</b>		<b>Nickel &amp; nickel alloys</b>													
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

<b>Issue # 1</b>		<b>DECLARED MATERIALS LIST</b>										<b>HSO-CDF-LI-074</b>					
<b>Project:</b>		<b>Herschel-SPIRE</b>															
<b>Institute:</b>		<b>Cardiff University</b>															
<b>Prepared by:</b>		<b>Peter Hargrave</b>															
<b>Category:</b>		<b>4</b>		<b>Titanium &amp; titanium alloys</b>													
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

<b>Issue # 1</b>		<b>DECLARED MATERIALS LIST</b>										<b>HSO-CDF-LI-074</b>					
<b>Project:</b>		<b>Herschel-SPIRE</b>															
<b>Institute:</b>		<b>Cardiff University</b>															
<b>Prepared by:</b>		<b>Peter Hargrave</b>															
<b>Category:</b>		<b>5</b>		<b>Steels</b>													
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		6 Stainless steels																
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
6-1	Stainless steel 304L	Commercial product. Extrusion / plate / rod	Durbin metal industries Ltd, Unit 0, Lawrence drive, Stover trading estate, Yate, Bristol BS37 5PG	Machined	300mK Photometer bus-bar supports. (LTS-PFM-100, LTS-PFM-200) 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W3							ISO9000		
			Metalfast Ltd, Swindon <a href="http://www.metalfast.co.uk">www.metalfast.co.uk</a>													ISO9002		
			Orchard Materials Ltd, Unit 20, Cooper road, Thornbury industrial estate, Thornbury, Bristol BS35 3UW													ISO9002		
6-2	Sandvik SANMAC 304L	Hot finished Stainless steel 304L tube	TW Metals Ltd, Majestic road, Nursling Estate, Nursling, Southampton, SO16 0AF Cert. # A/02-124674 A/01-926414 A/02-950954	Machined	Dichroics FILT-PFM-310, FILT-PFM-320 Beam dividers FILT-PFM-410, FILT-PFM-420	I	V	1	W2							ISO9002		



Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		8 Miscellaneous metallic materials															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		9 Optical materials															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		10 Adhesives, coatings, varnishes																
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
10-1	Epotek-920FL	Two-part loaded thermally conductive epoxy. Cert. of analysis#90-3421/67-3421	Promatech Ltd, 2 Wilkinson Road, Cirencester, Gloucestershire, GL7 1YT	Mixed as per manufacturer's instructions. Cured at 80°C for 4 Hours.	Component of black coating BG1 and BG7B (see below)  Encapsulation of Kevlar cord ends – 300mK photometer bus-bar supports & light baffles	I	V	1	W1						ESA approved epoxy			
10-2	Epotek-920	Two-part loaded thermally conductive epoxy. Cert. of analysis#45-3421/67-3421			SCal assembly (bonding heaters and thermometers to sources)	I	V	1	W0						ESA approved epoxy			
10-3	Cardiff black coating – BG1	High emissivity coating for stray light & thermal control. Based on Epotek-920FL with carbon loading.	In-house process	HSO-CDF-PR-050	SCal assembly. SCAL-PFM-000 PCal assembly. PCAL-PFM-000. General SPIRE use – ref. SPIRE-RAL-NOT-001816 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W2						Fully flight qualified Get qual report from RAL			
10-4	Cardiff black coating – BG7B	High emissivity coating for stray light & thermal control. Based on Epotek-920FL with carbon and SiC loading.	In-house process	HSO-CDF-PR-049	SCal assembly. SCAL-PFM-000 General SPIRE use – ref. SPIRE-RAL-NOT-001816	I	V	1	W3						Fully flight qualified Get qual report from RAL			

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		11	Adhesive tapes														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		12	Paint & inks														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		13	Lubricants														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												



<b>Issue # 1</b>		<b>DECLARED MATERIALS LIST</b>										<b>HSO-CDF-LI-074</b>					
<b>Project:</b>		<b>Herschel-SPIRE</b>															
<b>Institute:</b>		<b>Cardiff University</b>															
<b>Prepared by:</b>		<b>Peter Hargrave</b>															
<b>Category:</b>		<b>14 Potting compounds, sealants, foams</b>															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

<b>Issue # 1</b>		<b>DECLARED MATERIALS LIST</b>										<b>HSO-CDF-LI-074</b>					
<b>Project:</b>		<b>Herschel-SPIRE</b>															
<b>Institute:</b>		<b>Cardiff University</b>															
<b>Prepared by:</b>		<b>Peter Hargrave</b>															
<b>Category:</b>		<b>15 Reinforced plastics</b>															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

<b>Issue # 1</b>		<b>DECLARED MATERIALS LIST</b>										<b>HSO-CDF-LI-074</b>					
<b>Project:</b>		<b>Herschel-SPIRE</b>															
<b>Institute:</b>		<b>Cardiff University</b>															
<b>Prepared by:</b>		<b>Peter Hargrave</b>															
<b>Category:</b>		<b>16 Rubbers &amp; elastomers</b>															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		17	Thermoplastics (non-adhesive tapes, foils (MLI).....)														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST											HSO-CDF-LI-074					
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		18 Thermoset plastics																
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
18-1	Torlon	Polyamide-imide	RS components Ltd, PO box 99 Corby Northants NN17 9RS Part# 257-7079	Machined	SCal sources SCAL-PFM-000  300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W1						Flight qualified / approved Check....	ISO9001		
18-2	Polypropylene film	Polypropylene "PHD" material various thicknesses in range 3.7µm to 15µm "GND" material - 15µm to 50µm	Hoechst Trespaphan	Copper evaporation. Photolithography Hot-pressed. In-house process. Document ref... DPL....	Instrument filters, beam dividers, dichroics.	I	V	1	W2						Flight qualified. Heritage from ISO, Cassini, Spitzer...			
18-3	Polypropylene sheet	Polypropylene sheet – 2mm thick	North Sea Plastics Unit 2, 5 Campsie road, Kirkintilloch, Glasgow. G66 1SL	Hot-embossed. Processed by Cardiff MEC. Full address & contact info	Spectrometer detector lenses (300mK)	I	V	1	W1									



