



201 E. Defenbaugh
Kokomo IN 46902
(765) 457-8095
FAX (765) 457-9033
www.Residues.com



ISO 9002
Certified



Member
Since
1992

J-STD-004 Flux Qualification

AMTECH
Project #: 1219-06
PO #: 0213021540-WC

February 28, 2002

Ajits Premasiri
75 Schoolground Rd.
Branford, CT 06405

Phone: 203-481-0362
Fax: 203-481-5033
Email: ahp@amtechinc.com

Report Approved by:

A handwritten signature in black ink, appearing to read 'Terry Munson', is written over a horizontal line.

Terry Munson, President

ResiduGuru@aol.com



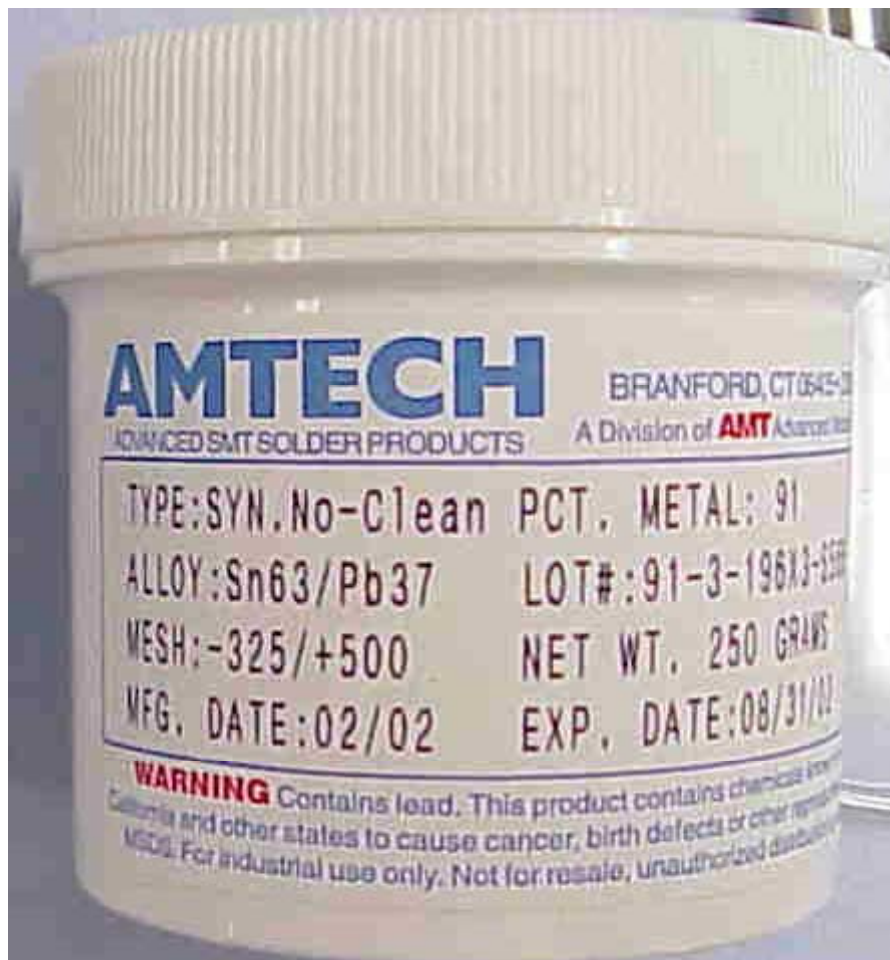
J-STD-004 Flux Qualification

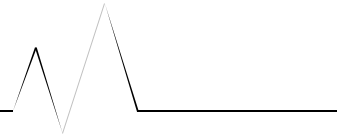
Project # 1219-06

Ajits Premasiri

PROJECT GOAL

The purpose of this project was to qualify solder paste. All residues in this evaluation were characterized using IPC J-STD-004 for solder paste flux qualification, SIR per IPC-TM-650, method 2.6.3.3, Halide content using Ion Chromatography per IPC-TM-650, method 2.3.28. and per IPC-TM-650, method 2.3.35, copper mirror testing





Qualification Test Report

I.D. Number: Sn63/Pb37 Metal 91 (Mesh-325/+500)				
Flux Designator: LO			Date of Manufacture: 2-13-02	
SynTECH			#91-3-196X3-S566	
Tested By: Eric Camden		Pass [x]		
Witnessed By: Terry Munson CSL		Fail []		
Test	Paragraph Requirement	IPC-TM-650 Method	Test Requirement	Result Pass/Fail/NA
Copper Mirror	3.2.1	2.3.32		Pass
Qualitative (Optional) Sliver Chromate	3.3.2.1	2.3.33		Pass
Qualitative (Optional) Fluoride Spot	3.3.2.2	2.3.35.1		NA
Quantitative Halides Fluoride, Chloride, Bromide	3.3.3.1, 3.3.3.4	2.3.35, 2.3.28		Pass
Corrosion	3.3.4	2.6.15	Not Cleaned	Pass
SIR (Required) 85°C 85% R.H.	3.3.5.1	2.6.3.3	Cleaned	NA
			Not Cleaned	Pass
SIR (Optional) 40°C 93% R.H.	3.3.5.2	--	Cleaned	NA
			Not Cleaned	NA
SIR (Optional) 35°C 85% R.H.	3.3.5.2	--	Cleaned	NA
			Not Cleaned	NA
Electrochemical Migration (Optional)	3.3.6	2.6.14.1	Cleaned	NA
			Not Cleaned	NA



Flux Induced Corrosion (Copper Mirror Method) 2.3.32

1.0 Scope

This test method is designed to determine the removal effect the flux has (if any) on the bright copper mirror film which has been vacuum deposited on clear glass.

5.2 Test

- 5.2.1 Place the copper mirror test panel on a flat surface, mirror side up, and protect from dust and dirt at all times.
- 5.2.2 Place one drop of test flux or extract to be tested on each copper mirror test panel. Do not allow the dropper to touch the test panel.
- 5.2.3 Solder-paste shall be applied directly to the mirror without scratching the copper mirror, with a volume approximating a 0.5 mm thickness and 8 mm diameter. (It has been determined that significant variations from this quantity have little effect for most materials.)
- 5.2.4 Immediately also place one drop of the control standard flux adjacent to the test flux. Do not allow drops to touch.
- 5.2.5 Place test panels in a horizontal position in the dust free cabinet at $23 \pm 2^{\circ}\text{C}$ and $50 \pm 5\%$ relative humidity for $24 \pm \frac{1}{2}$ hours.
- 5.2.6 At the end of the 24 hour period, remove the test panels and remove the test flux and control standard fluxes by immersion in clean 2-propanol. copper only around the perimeter of the drop defines the flux as M. Complete removal of the copper places the flux in the H category. (See Figure 1).

5.3 Evaluation

- 5.3.1 Carefully examine each test panel for possible copper removal or discoloration.
- 5.3.2 If there is any complete removal of the copper film as evidenced by the background showing through the glass, the test flux has failed the L category. Complete removal of the copper only around the perimeter of the drop defines the flux as M. Complete removal of the copper places the flux in the H category. (See Figure 1).
- 5.3.3 If the control flux fails, repeat the entire test, using new copper mirror test panels.
- 5.3.4 Discoloration of the copper film due to a superficial reaction or only a partial reduction of the copper film thickness is not considered a failure.

Corrosion, Flux (2.6.15)

1.0 Scope

This test method is designed to determine the corrosive properties of flux residues under extreme environmental conditions. A pellet of solder is melted in contact with the test flux on a sheet metal test piece. The solder is then exposed to prescribed conditions of humidity and the resulting corrosion, if any, is assessed visually.



- 5.2.2.1 Solder Paste, Cored-Wire or Cored-Preform
Place 1 g of solder paste, flux-cored wire or cored-preform into the depression in the test panel.
- 5.2.3 Using tongs, lower each test panel onto the surface of the molten solder.
- 5.2.4 Allow the test panel to remain in contact until solder specimen in the depression of the test panel melts. Maintain this position for 5 ± 1 seconds.
- 5.2.5 Carefully examine test specimen at 20X magnification for subsequent comparison after humidity exposure. Record observations, especially any discoloration.
- 5.2.6 Preheat test panel to $40 \pm 1^\circ\text{C}$ for 30 ± 2 minutes.
- 5.2.7 Preset humidity chamber to $40 \pm 1^\circ\text{C}$ and $93 \pm 2\%$ relative humidity.
- 5.2.8 Suspend each test specimen vertically (and separately)

5.2 Test

- 5.2.1 Heat solder pot so that solder bath stabilizes at $235 \pm 5^\circ\text{C}$.
- 5.2.2 Liquid Flux Place 0.035 g of flux solids into the depression in the test panel. Add solder sample.
- 5.2.9 Expose specimens to the above environment for 240 hours (10 days). M and H may be tested in the cleaned, as well as uncleaned, condition.
- 5.3 Evaluation Carefully examine specimens prior to placing them in the environmental chamber. Note any discoloration.
- 5.3.1 After the appropriate exposure period, remove test specimens from humidity chamber, examine at 20X magnification and compare with observations noted in paragraph 5.2.5.
- 5.3.2 Corrosion is described as follows:
 - A. Excrescences at the interfaces of the flux residue and copper boundary, or the residues or discontinuities in the residues.
 - B. Discrete white or colored spots in the flux residues.
- 5.3.3 An initial change of color which may develop when the test panel is heated during soldering is disregarded, but subsequent development of green-blue discoloration with observation of pitting of the copper panel is regarded as corrosion.

6.0 Notes

- 6.1 Definition of Corrosion For purposes of this test method, the following definition of corrosion shall prevail. "A chemical reaction between the copper, the solder, and the constituents of the flux residues, which occurs after soldering and during exposure to the above environmental conditions."
- 6.2 Color photos before and after the test are valuable tools in identifying corrosion. (See 5.2.5.)
- 6.3 Safety Observe all appropriate precautions on MSDS for chemicals involved in this test method.



TEST PROCEDURE – QUANTITATIVE HALIDES TEST ION CHROMATOGRAPHY (IPC-TM-650, METHOD 2.3.28)

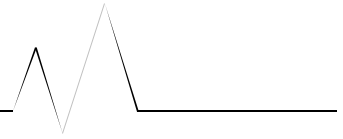
This evaluation used Ion Chromatography per IPC-TM-650, method 2.3.28 to characterize process residues.

1. The test samples were placed into clean KAPAK™ (heat-sealable polyester film) bags.
2. A mixture of isopropanol (75% volume) and deionized water (25% volume) was introduced into the bags, immersing the test samples. NOTE: The heat-sealed bags included an opening for ventilation.
3. The bags were inserted into an 80°C water bath for one hour. After one hour, the bags were removed from the water bath and the test samples removed from the bags. The test samples were placed on a clean holding rack for air drying at room temperature.
4. Controls and blanks were performed on a Dionex DX-120 ion chromatography system before the test began. NOTE: CSL used NIST-traceable standards for all system calibrations.
5. A 1.5mL sample of each test sample's extract solution was analyzed using a 1.7mM sodium bicarbonate/1.8mM sodium carbonate eluent.

DATA DISCUSSION - ION CHROMATOGRAPHY

The attached page(s) show the data for this evaluation. The data table lists the ion chromatography data in micrograms of the residue species per square inch of extracted surface ($\mu\text{g}/\text{in}^2$), unless otherwise noted. One should not confuse this measure with micrograms of sodium chloride equivalent per square inch, which is the common measure for most ionic cleanliness test instruments.

Ion chromatography detected the following anion residues: weak organic acids (WOA). The following ions were analyzed for but not detected: fluoride (F^-), chloride (Cl^-), bromide (Br^-), sulfates (SO_4^{2-}), nitrates (NO_3^-), phosphates (PO_4^{2-}), methane sulfonic acid (MSA), and conductive organic elements.



Weak Organic Acids (WOAs)

Weak organic acids, such as adipic or succinic acid, serve as activator compounds in many fluxes, especially no-clean fluxes. WOAs are typically benign materials and are therefore not a threat to long term reliability. In order to avoid formulation disclosure difficulties with flux manufacturers, we group all detected weak organic acid species together and refer to them collectively as WOAs.

Weak Organic Acids on Assemblies

WOA levels vary greatly, depending on the delivery method (e.g. foam vs. spray) and the preheat dynamics. In general, water-soluble fluxes have a much lower WOA content than do low-solids (no-clean) fluxes, and the amount of residual WOA is proportional to the amount of residual flux. Bare boards typically do not contain WOA residues. When WOA levels are under 400 $\mu\text{g}/\text{in}^2$, the residues are generally not detrimental.

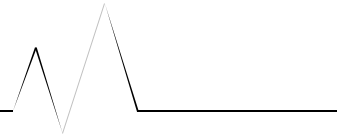
Process	Level
Low solids solder paste	0 – 20 $\mu\text{g}/\text{in}^2$
Spray-applied, low-solids flux	20 – 120 $\mu\text{g}/\text{in}^2$
Foam-applied flux process	250 – 400 $\mu\text{g}/\text{in}^2$
Water soluble flux with good cleaning	0 – 15 $\mu\text{g}/\text{in}^2$

TABLE 6
CSL WOA Guidelines for Assemblies

Excessive WOA amounts (appreciably greater than 400 $\mu\text{g}/\text{in}^2$) present a significant reliability threat for finished assemblies. An excessive amount of flux can produce the situation in which the thermal energy of preheat is spent driving off the solvent thereby not allowing the flux to reach its full activation temperature. Unreacted flux residues readily absorb moisture that promotes the formation of corrosion and the potential for current leakage failures.

Conclusions

The Syntech solder cream from AMTECH passes the IPC and J-STD-004 testing for a LO type flux.



AMTECH

Project: 1219-06
 Date: February 28, 2002
 Contact: Ajits Premasiri
 P.O. Number: 0213021540-WC

Address: 75 School ground Rd.
 Branford, CT 06405
 Phone: 203-481-0362
 Fax: 203-481-5033

J-STD-004 Flux Qualification

CSL ID#	Sample Description	Copper Mirror Test			
		Mirror 1	Mirror 2	Mirror 3	Control
	SynTech No Clean Cream				
1219-06-01	Mfg date 2-13-02 Lot# 91-3-196X3-S566	Pass	Pass	Pass	Pass
		Corrosion Test			
	SynTech No Clean Cream	Copper 1	Copper 2		
1219-06-01	Mfg date 2-13-02 Lot# 91-3-196X3-S566	Pass	Pass		

NOTE: All values in $\mu\text{g}/\text{in}^2$, unless otherwise noted.

CSL ID#	Sample Description	Ion Chromatography				Silver Chromate Paper No halides detected
		Cl ⁻	Br ⁻	F ⁻	WOA	
	SynTech No Clean Cream					
1219-06-01	Mfg date 2-13-02 Lot# 91-3-196X3-S566	<0.1ppm	<0.1ppm	<0.1ppm	331 ppm	

CSL ID#	Sample Description	SIR Testing					
		Pattern Number	Initial (ambient)	24 Hrs (85/85)	96 Hrs (85/85)	168 Hrs (85/85)	Final (ambient)
	SynTech No Clean Cream						
	Mfg date 2-13-02					Pass	Pass
	Lot# 91-3-196X3-S566						
1219-06-02	B-24 procesed board #1	average	3.40E+11	2.90E+09	3.80E+09	2.90E+10	2.90E+11
1219-06-03	B-24 procesed board #2	average	3.60E+11	2.40E+09	3.50E+09	2.10E+10	2.20E+11
1219-06-04	B-24 procesed board #3	average	4.30E+11	2.30E+09	2.90E+09	2.10E+10	2.00E+11
1219-06-05	B-24 procesed board #4	average	7.50E+11	3.00E+09	3.10E+09	2.70E+10	2.20E+11
1219-06-06	B-24 procesed board #5	average	2.50E+11	2.10E+09	3.00E+09	1.80E+10	2.20E+11
1219-06-07	B-24 procesed board #6	average	2.80E+12	1.60E+09	2.40E+09	1.50E+10	1.80E+12
	Unprocessed Control#1	average	3.70E+12	1.80E+09	3.30E+09	2.10E+10	2.10E+12
	Unprocessed Control#2	average	1.80E+11	7.30E+09	5.50E+09	5.90E+10	2.00E+12
	Unprocessed Control#3	average	1.10E+11	6.50E+09	4.70E+09	3.80E+10	2.00E+11