SIR 90 day Monitoring of Desiccators

Steel Camel

Project Steel Camel 01

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Reported By: _____

Terry Munson, President

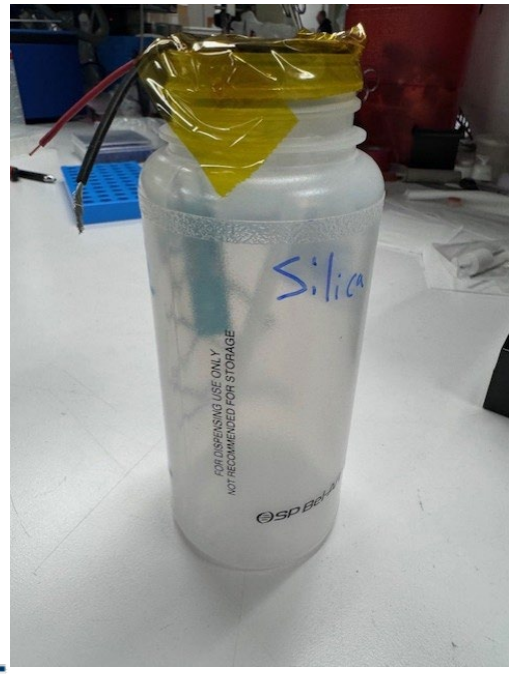
ISO 9001:2015
Registered Firm
Since Nov. 2000

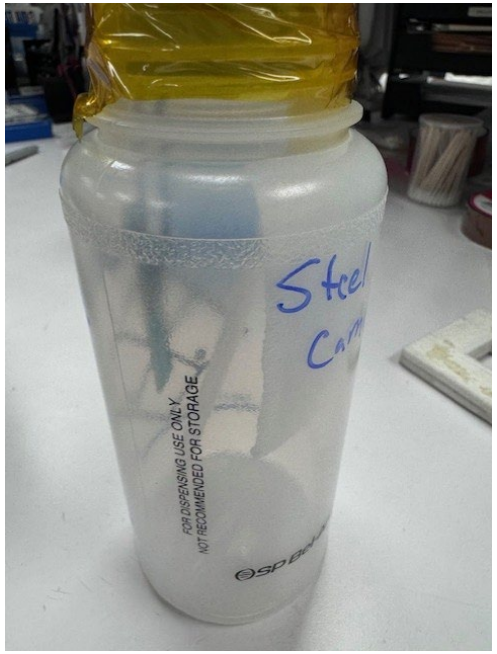
Project Goal

The goal of this project was to assess the SIR resistance of storage conditions.

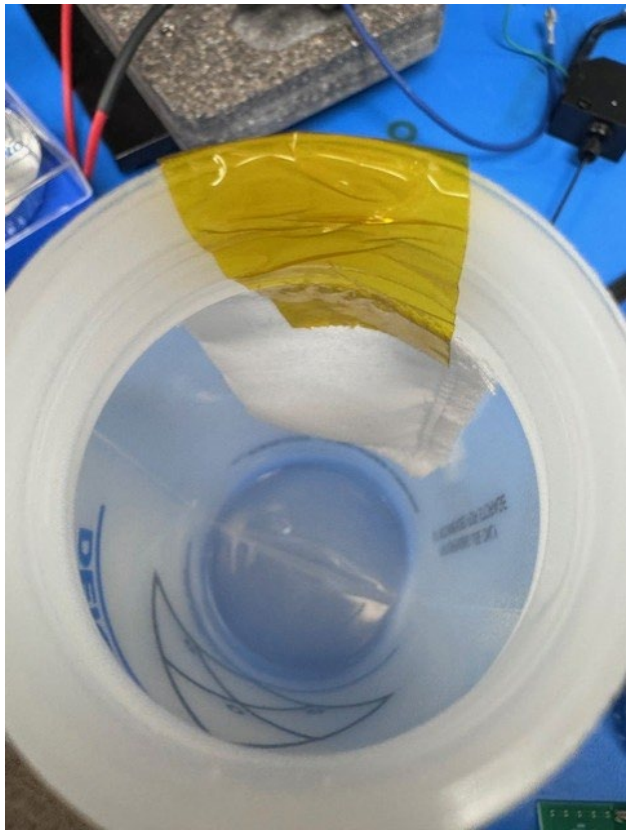
Background / History / Assembly Material

Two sets of desiccant conditions were to be stored at room temperature in a high humidity area (75% RH as a room with and inline cleaner) and resistance measurements were taken daily on PCB electrodes internal to the sealed enclosure.

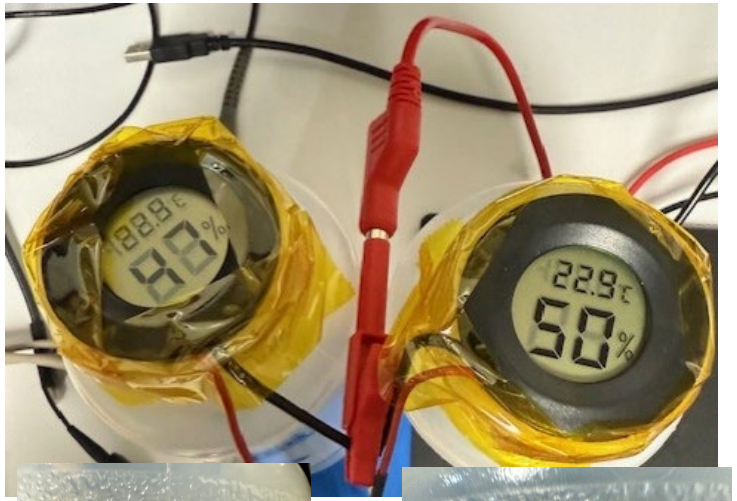


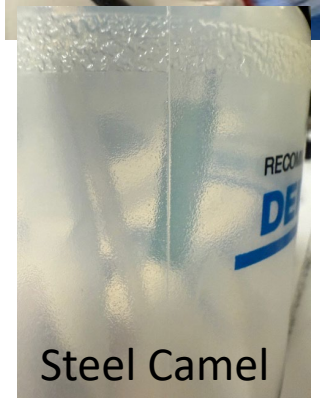


Desiccant Samples Suspended in Containers

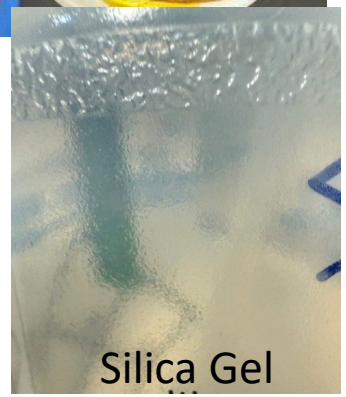


Steel Camel





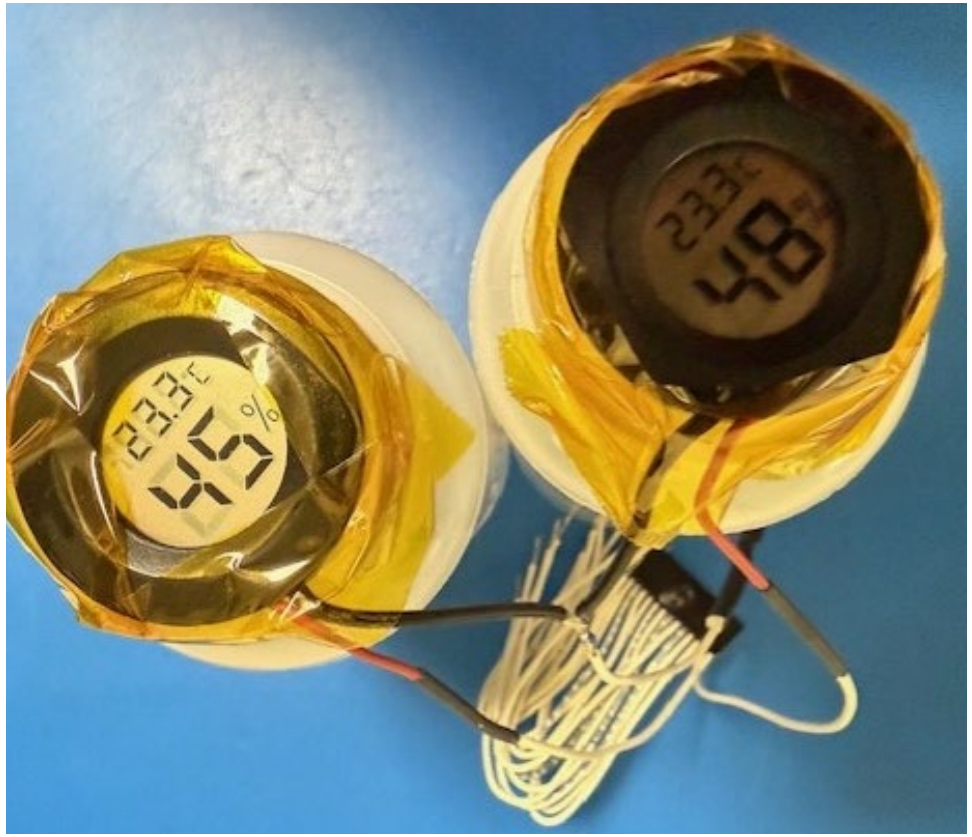
Steel Camel



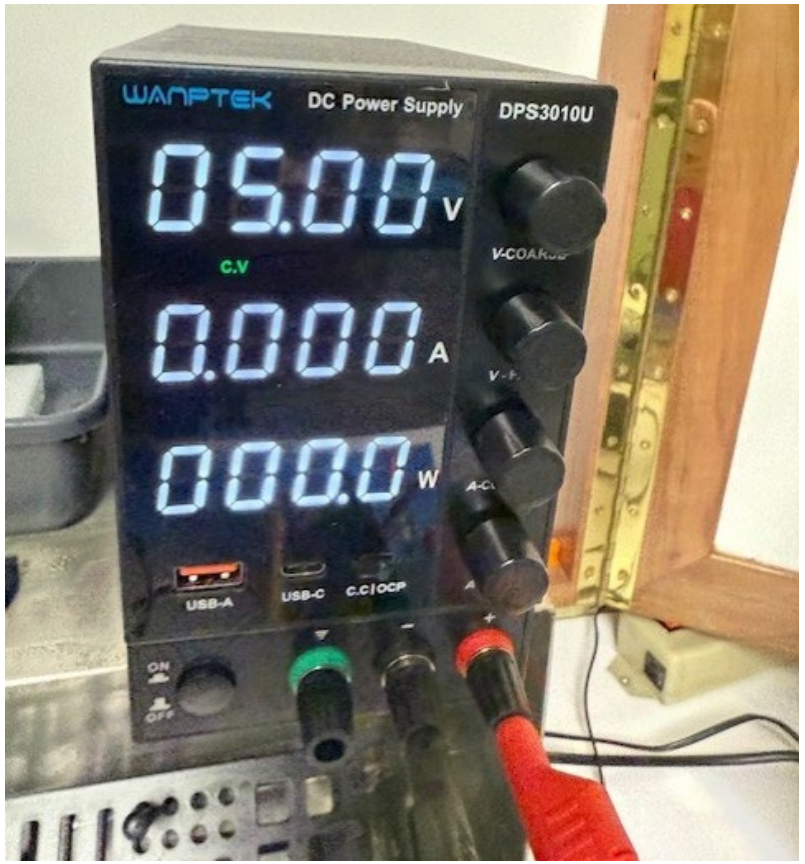
Silica Gel

Silica Gel

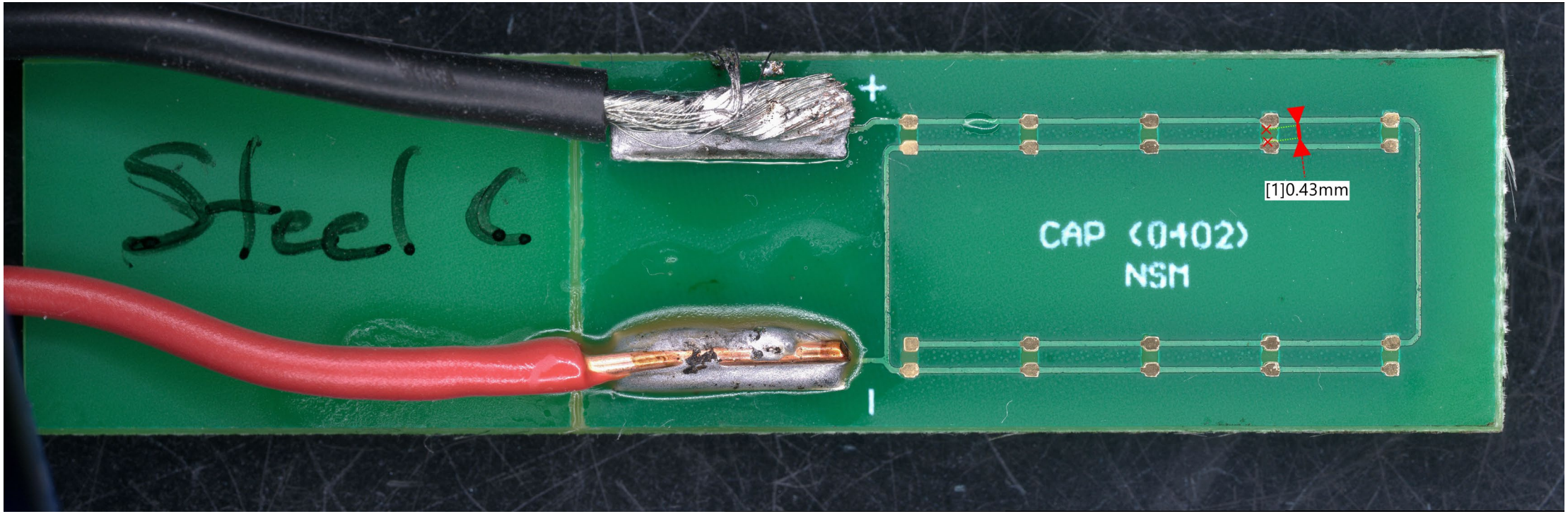
At the end of 3 months



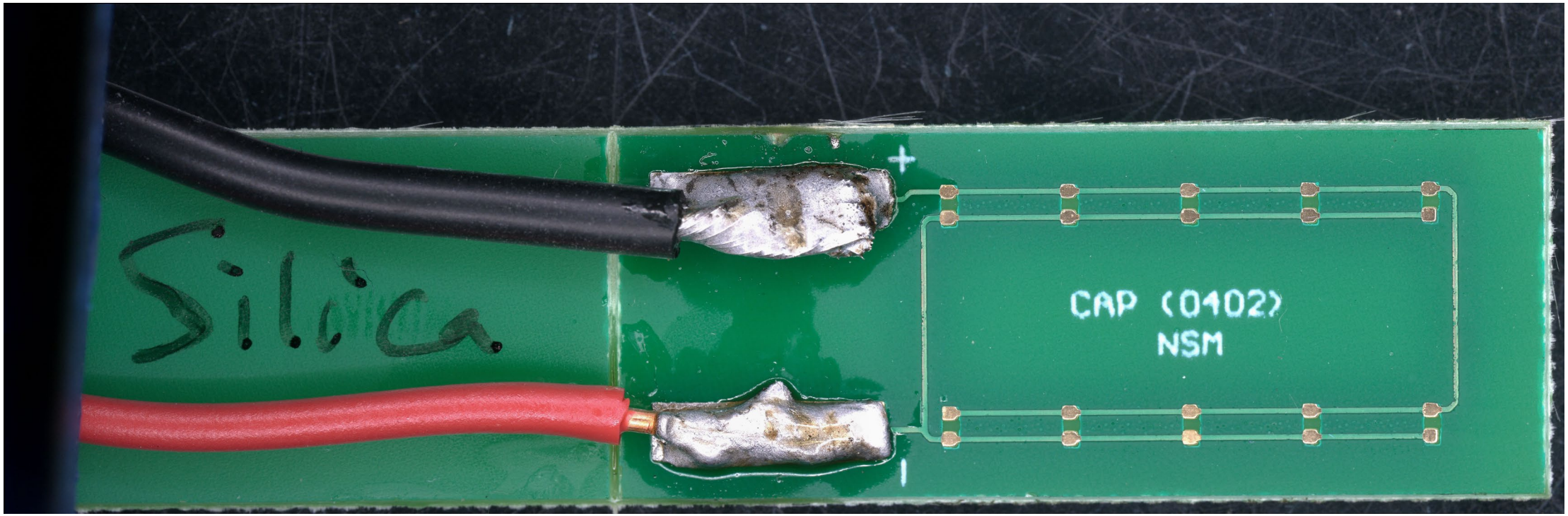
Post SIR LCR verified Resistance

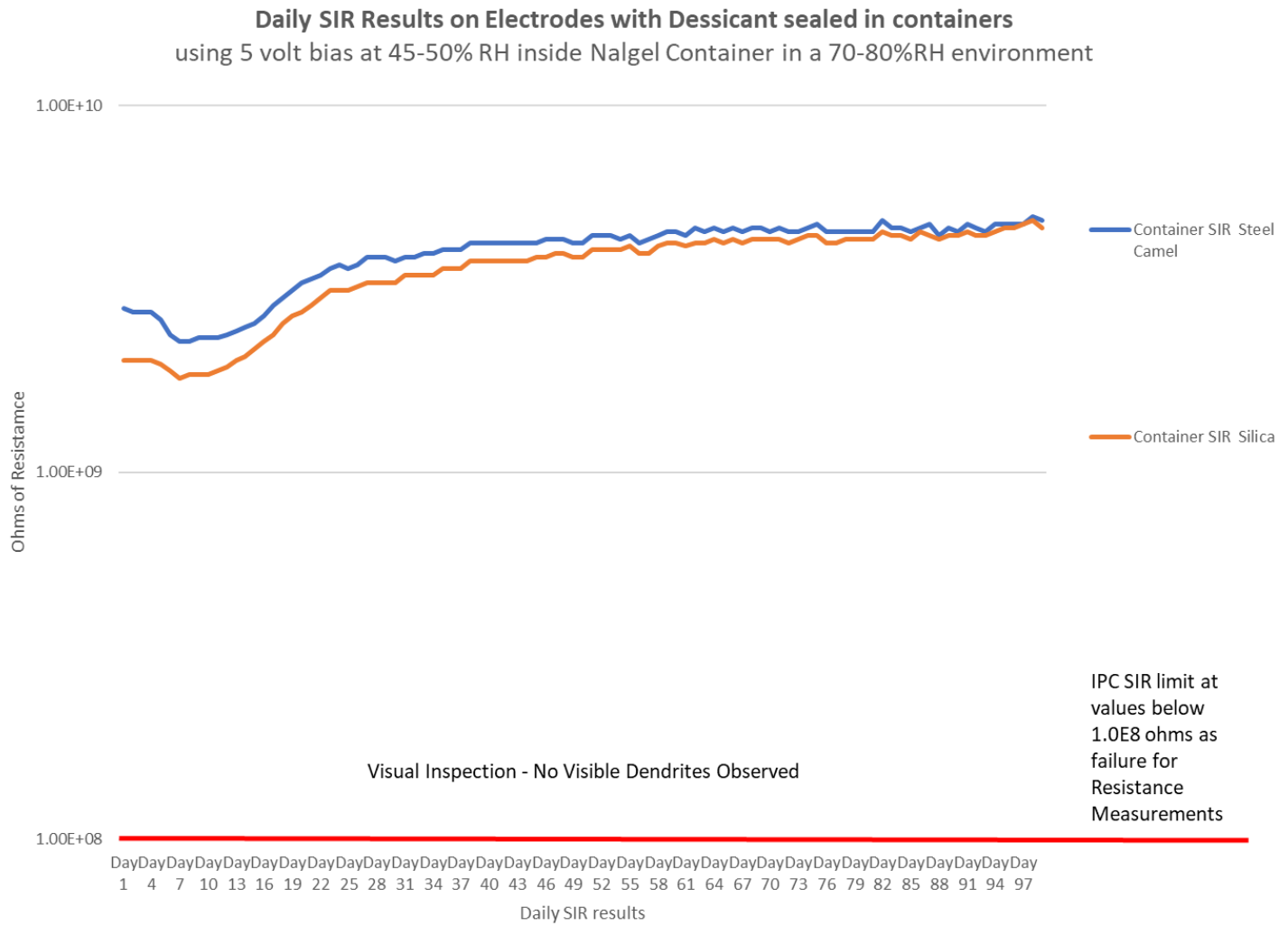


Steel Camel Electrode (spacing of pads at 0.4mm)

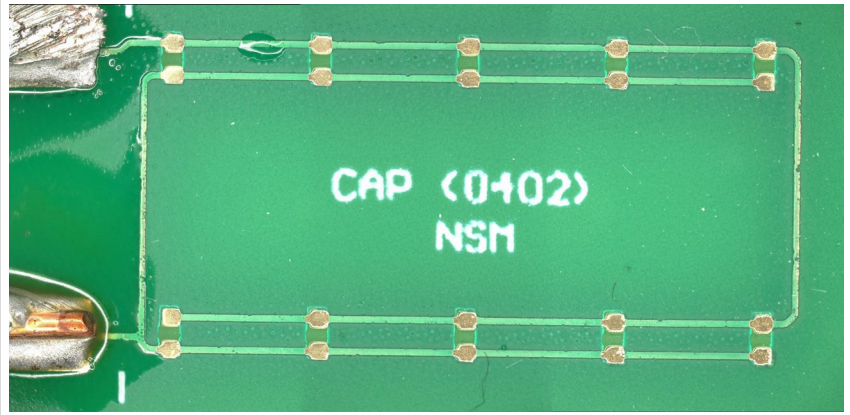


Silica Electrode to be suspended

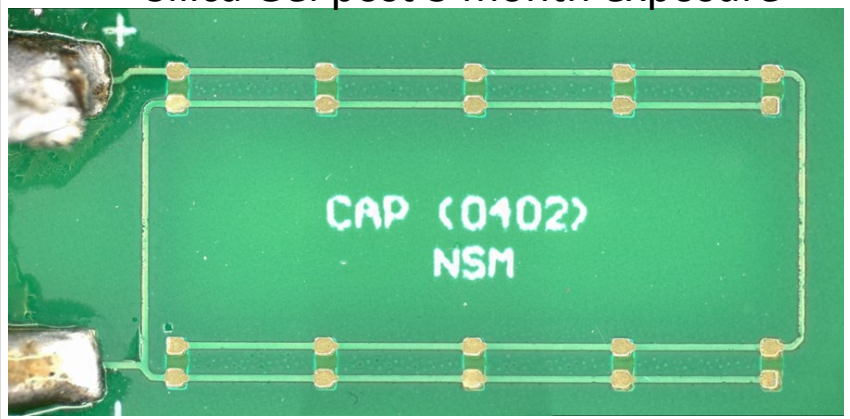




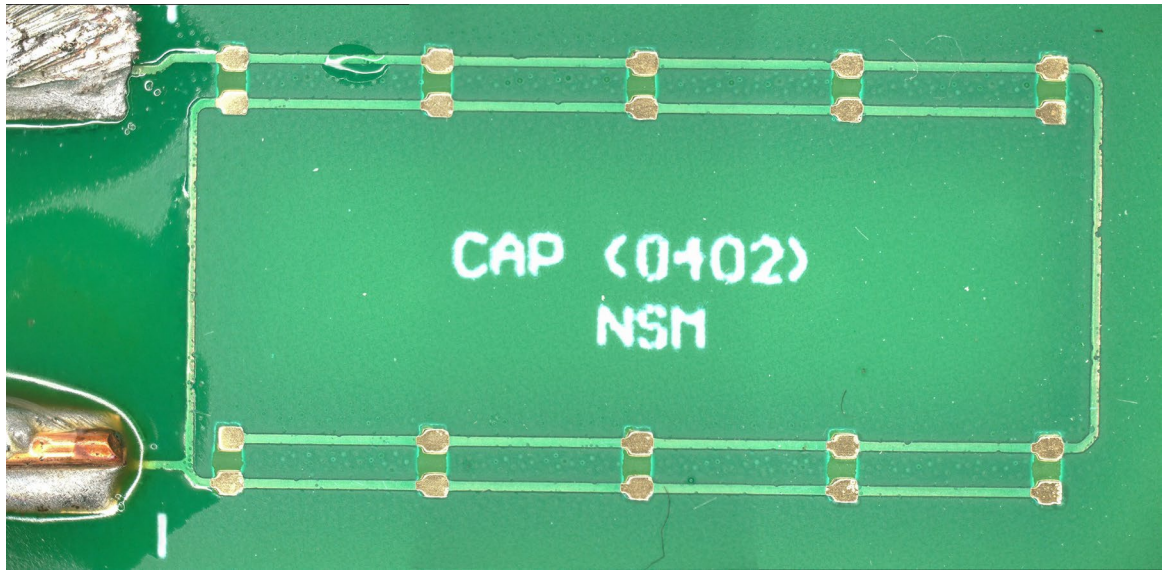
Steel Camel post 3 month exposure



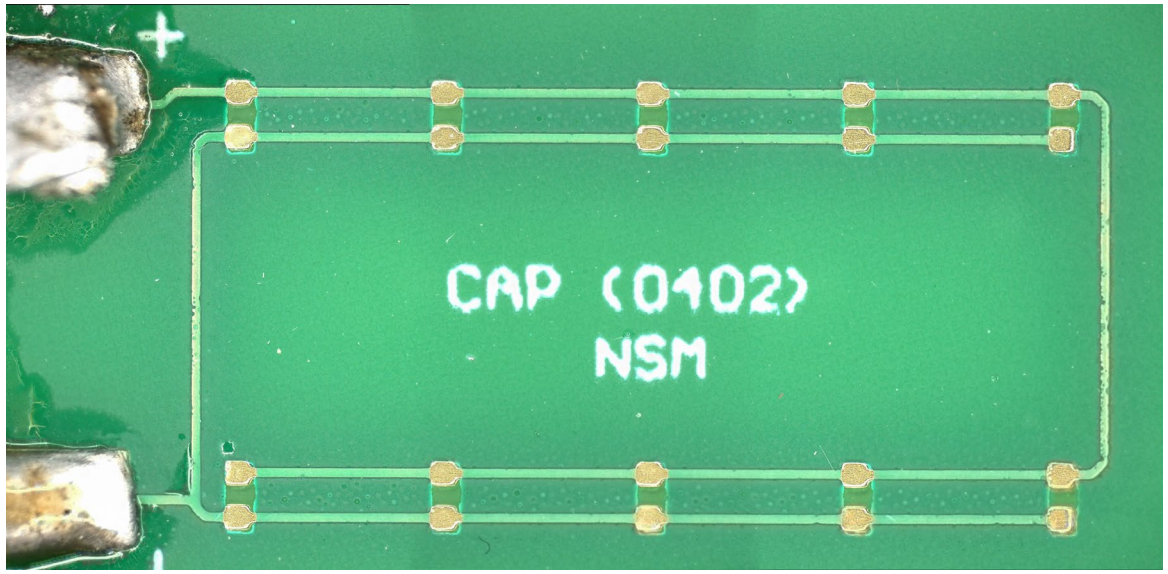
Silica Gel post 3 month exposure



After 3 months of exposure

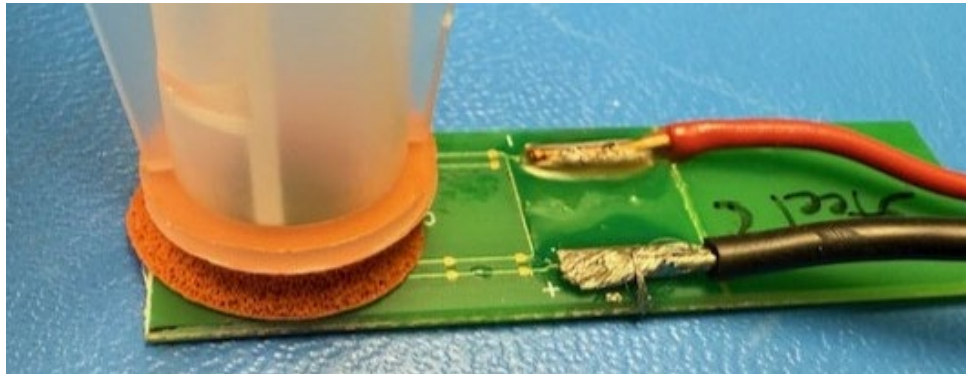


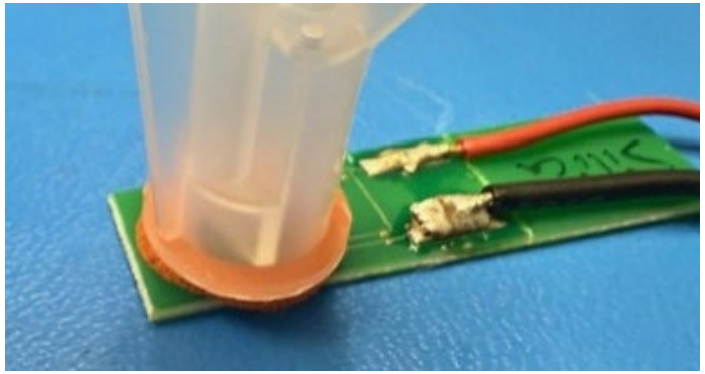
Steel Camel post 3 month exposure
No visible dendrites at 5 volts



Silica Gel post 3 month exposure
No visible dendrites at 5 volts

Post 3 months Cleanliness Assessment





all values in ug/in^2		Ion Chromatography (Dionex ICS 3000 at Foresite) n/a = not applicable																C3 Tester	
		Fluoride	Acetate	Formate	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate	WOA	MSA	Lithium	Sodium	Ammonium	Potassium	Magnesium	Calcium	Results	Time(sec)
Foresite recommended limits for Bare Boards		3	2.5	2.5	2.0	2.5	2.5	2.5	2.5	3.0	n/a	0.5	2	2	2.5	2	n/a	n/a	Clean	>120
ID	**Sample Description**																			
1	Steel Camel Post 3 months	0	0	0	0.15	0	0	0.01	0	0.74	0	0	0	1.89	0.15	0	0	0.10	Clean	180
2	Silica Gel Post 3 months	0	0.39	0	1.99	0	0	0.35	0	1.01	0	0	0	1.61	0.36	0	0	0.36	Clean	159

Foresite Recommended Cleanliness Limits

We at Foresite, Inc., over the past 20+ years, have studied field failures of electronics, primarily resulting from manufacturing process residues on the assembly's surfaces. From these studies we have correlated concentrations of specific contaminants with product reliability through the use of ion chromatography. Repeatedly we have shown that controlling the concentration of ions at or below our developed limits results in elimination of failure root causes associated with electronics cleanliness, or rather, lack thereof.

The following table contains the recommended limits, regardless of electronics product class – when residues are present in detrimental concentrations, reliability suffers, regardless of the application… just quicker in harsher environments.

		Fluoride	Acetate	Formate	Methanesulfonic Acid	Chloride	Nitrate	Bromide	Nitrite	Phosphate	Sulfate	Weak Organic Acid	Weak Organic Acid	Lithium	Sodium	Potassium	Ammonium	Calcium	Magnesium	C3 - IPC Class 2 & 3	C3 - IPC Class 1
		F^-	$C_2H_3O_2^-$	HCO_2^-	MSA	Cl^-	NO_3^-	Br^-	NO_2^-	PO_4^{3-}	SO_4^{2-}	SMT hand & selective	Wave direct contact	Li^+	Na^+	K^+	NH_4^+	Ca^{2+}	Mg^{2+}	time/µA	time/µA
Bare Boards	PCB Pre-mask	2.5	2.5	2.5	0.5	2	2.5	2.5	2.5	2.5	3	n/a	n/a	2	2	2	2.5	n/a	n/a	>120s / 250µA	>60s / 500µA
	Via or PTH																				
	Soldermask Surface																				
	SMT Pad Area																				
	Innerlayer*										*10										
Component	BGA	1	3	1	1	1	2	6	2	2	1	25	n/a	1	2	2	2.5	n/a	n/a	>120s / 250µA	>60s / 500µA
	Reballed BGA																				
	Tinned																				
	IC Flip Chip																				
	Trayed Component																				
PCBA (no clean)	NC Via Top	1	3	3	1	3	3	6	3	3	3	25	150	3	3	3	3	n/a	n/a	>120s / 250µA	>60s / 500µA
	Solder Area																				
	NC SMT																				
	NC Wave																				
	Reworked																				
PCBA (clean)	NC/WSF Via Top	1	3	3	1	6	3	6	3	3	3	25	25	3	3	3	3	n/a	n/a	>120s / 250µA	>60s / 500µA
	Selective																				
	NC/WSF SMT																				
	NC/WSF Wave																				
	Rework/Misprint																				
Support Hardware	Heat Sink	1	3	3	1	2	3	6	3	3	3	n/a	n/a	1	1	3	2	n/a	n/a	>120s / 250µA	>60s / 500µA
	Housing/ESD Foam																				
	Thermal Material																				
	Thermal Pad																				
	Battery Housing																				

Findings

- The Steel Camel Desiccant performed as well as a standard silica gel and showed no surface contamination after 3 months of exposure by C3/Ion Chromatography analysis. No visible dendrites or shorting occurred during the 3 months of 5 volt bias to the electrodes. This material performed as well as the current silica gel material on these parameters.