Terry Munson

Is White Residue a Reliability Risk?

Not all white residues pose a threat to performance.

I am frequently asked if white residue is a problem. The answer depends on what the source of the white residue is and what caused it to turn white.

The white flaky residues seen on assemblies are often due to flux and moisture. The variables that affect product performance include: the cleanliness of the bare board; whether the flux is no clean or water soluble; heat activation of no-clean fluxes; and cleaning.

White Residue on No-Clean Assemblies

Brush cleaning with water or isopropyl alcohol (IPA) can leave a white residue that is possibly conductive and moisture absorbing. Rework occurs in sensitive areas of the assembly, creating added concern about the residue's harmfulness.

Extra flux reacting with an area of surface-mount paste can also leave a white residue. But if fully heat activated, the flux residue is benign and not moisture absorbing or conductive. This is true only for assemblies with clean bare boards; dirty hot air solder level (HASL) boards still pose a risk of electrical leakage.

Possible Residue Causes on Cleaned Assemblies

If white residue is on the topside surface between pads, it is most likely due to partial cleaning of the paste flux residues. If the residue is on the bottom side leading or trailing edges, the thicker flux buildup on the bottom side probably has been only partially cleaned.

Case Study

In one case study, we evaluated heavy white residue on the topside of an assembly around the reworked surface-mount static random access memories (SRAMs). Each assembly showed visible residue after the hot gas surface-mount rework. The customer did not know if the residues would be harmful. Each assembly was processed with no-clean solder paste, then the SRAM quad flat pack (QFP) was removed before new SRAMs were placed and soldered using a hot gas reflow system.

To determine the effects and residue type, our lab used surface insulation resistance (SIR) testing and ion chromatography per IPC protocols. Ten SRAM areas were isolated to examine with SIR testing, and 10 separate SRAM areas were isolated to examine with ion chromatography. Our analyses showed that the residue was benign and that leaving it on the board would be better than trying to remove it.

Conclusions

If white residues are caused by flux residue from the rework process, they can function as a protective and insulative barrier on the board. Good testing procedures and understanding of process residues will help you to understand if a white residue poses a reliability risk. ■

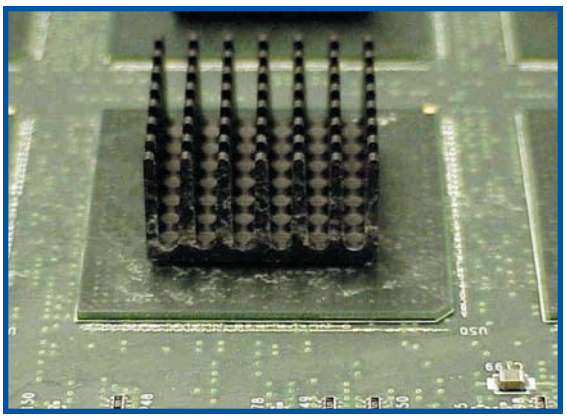

FIGURE 1: A typical example of white residue after rework.

		Ion Chromatography (IC)				SIR
Sample Description ***(separate areas were used for IC & SIR testing sites)***		Cl^-	Br^-	SO_4^{2-}	WOA	85°C / 85%RH
Recommended Cleanliness Limits	Bare Board	2	6	3	0	
	No Clean Assembly	3	12	3	150	
Reworked assemblies with white residue						168 hrs
Area #1		1.29	9.27	2.45	147.30	Pass
Area #2		1.15	9.07	1.58	135.24	Pass
Area #3		1.08	8.46	2.39	140.39	Pass
Area #4 reference area		1.36	9.34	1.01	59.89	Pass
Saponified and steam clean boards						
Area #1		0.28	3.79	0.74	23.26	Pass
Area #2		0.39	3.65	0.56	24.15	Pass
Area #3		0.24	3.71	0.64	23.38	Pass
Area #4 reference area		0.33	3.65	0.49	20.15	Pass
Bare boards prior to assembly						
Area #1		1.95	2.94	2.04	0	Pass
Area #2		2.05	3.03	1.77	0	Pass
Area #3		1.87	3.21	1.36	0	Pass
Area #4 reference area		1.54	2.58	2.08	0	Pass
**All ion chromatography data is in µg/in²*						

TABLE 1: SIR and IC testing proves this customer's white residue is benign.

Terry Munson is with Foresite Inc. (residues.com); tm_foresite@residues.com. His column appears monthly.