Localized Contamination Can Cause Big Problems

Localized residues can be overlooked through bulk testing methods

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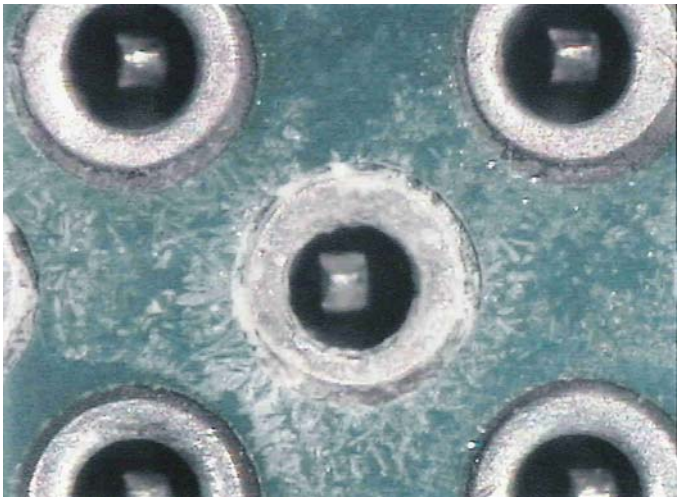
In today's electronics manufacturing environment, assemblers continue to overlook localized areas of contamination that are capable of causing product failures. By neglecting to examine sensitive localized areas, opportunities for electrochemical failures are exponentialized. The case we look at today involves a customer seeing visible white residues and dendritic growth in a connector area. Lucky for them, the residues were visible which caused them to investigate their source and potential damage. Many times, such residues are invisible and can go unnoticed until field problems occur.



Localized White Residue on Assembly

One assembly sample from a plant in Malaysia was sent to our laboratory for analysis to help troubleshoot this problem. For our analysis in this project, we utilized FTIR, SEM/EDX and Ion Chromatography analysis using localized extraction techniques with the C3 Cleanliness Tester. The FTIR analysis was able to show only flux residues. SEM/EDX showed a concentration of tin, lead, oxygen and copper. The high concentration of tin and lead caused us to deduce that electromigration was occurring in this area creating the white residue presence and visible dendritic growth. Because of these findings, we decided to analyze the area of white residue using ion chromatography so that we could better understand what contaminants were present and what they indicated about the manufacturer's process. The C3 Localized Cleanliness Tester allowed us the capability to extract a residue sample from a 0.1 in^2 area on both the connector area and its casing, as well as a reference area on the connector area and the casing. The C3 quickly showed 'Dirty' readings for the connector area with white residue presence and its casing area. Examining the reference areas on the connector and casing with the C3, we received 'Clean' readings for both. We took these four extracted samples and performed ion chromatography analysis. We found high levels of chloride, sulfate and weak organic acid (WOA) flux residues on the visible white residue sample from the connector and its casing. Conversely, we detected low and acceptable levels of ionic residue species on our two reference areas. This led us to believe that an external fluid contaminant had been introduced at some point and caused the visible white residues and dendritic growth. Looking at the board, the white residue appeared in a line like that of a drip, possibly caused by tap water which tends to be high in chloride and sulfate.

We recommended to this customer to monitor assembly processes more closely and determine the cause of the external fluid contaminant that was creating this reliability issue. This is one of a plethora of examples we have found in our lab's experience that is indicative of the importance of looking at boards in localized areas. If we were to have used industry test methods such as ROSE testing, the localized residues in this example could have been overlooked by extracting a sample from the entire board. This method would indicate that a residue problem did not exist, and that the white residues were potentially benign. The residues in this case were highly corrosive and were already causing problems that would only increase in the field. With methods available today, we are capable of looking at localized

areas individually to catch problems such as this before residues become visible and dendrites appear on the board. This capability is a great stride advancing quality control in the electronics manufacturing environment.

Anion Ion Chromatography Data

	Ion Chromatography					C3 Tester	
Sample Description	**Cl^-**	**Br^-**	**NO_2^-**	**SO4**	**WOA**	Result	Time(sec)
Top Reference Area	3.46	0.44	0.00	0.00	29.89	Clean	180
Connector White Residue Area	11.27	0.38	0.00	4.35	12.49	Dirty	33
Casing White Residue Area	7.44	0.00	0.00	4.87	0.00	Dirty	41
Casing Reference Area	1.52	0.00	0.00	0.22	0.00	Clean	180