Effect of No-Clean Flux Residues on the Performance of Acrylic Conformal Coating in Aggressive Environments

The influence of no-clean flux residues on the performance of acrylic conformal coating used for printed circuit board (PCB) assemblies was investigated under aggressive exposure conditions using plain coated laminates and PCBs with comb shaped surface insulation resistance (SIR) pattern. Plain laminate substrate and SIR PCBs were cleaned or dosed with no-clean flux residues prior to coatings. Performance studies were carried out by total immersion in deionized water at 60$^\circ$C for 10 days followed by microscopic investigations and potentiostatic studies on coated SIR patterns at 12 V potential bias and by measuring the resulting leakage current. For both plain laminates and SIR patterns, detailed investigation of the corrosion morphology was carried out. The amount of water intake by the coating was calculated by the weight-gain method. The amount of no-clean flux residue resulting at various temperatures was quantified using ion chromatography by extracting the residue, and surface morphology of the residues was investigated using optical microscopy. The flux residue in general consists of both resin and activator components such as carboxylic acids. Coated samples with flux residues after exposure showed blisters all over the surface and reduction in adhesion strength. The coated SIR PCBs with flux residues also showed failure due to electrochemical migration more quickly than on the clean PCBs.

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