

Cleaning No-Clean Fluxes Prior to Conformal Coating

A customer called the Helpline seeking advice for cleaning no-clean fluxes prior to applying a conformal coating.

The customer's assemblies were manufactured with a no-clean rosin based solder paste (ROLO) and were cleaned with an isopropyl alcohol (IPA) wash. After cleaning, a white residue was sometimes found in areas with high paste concentrations and was interfering with the adhesion of the conformal coating (Figure 1).

For conformal coatings to adhere properly, the printed circuit board (PCB) surface must be clean of fluxes and other residues. In addition, ionic contamination left by flux residues can lead to corrosion and dendrite growth, two common causes of electronic opens and shorts. Other residues can lead to unwanted impedance and physical interference with moving parts.

A conformal coating is only effective at preventing dendritic growth and corrosion if there are no ionic residues or active flux residues trapped under the coating. Since conformal coatings slowly absorb moisture, any residues that are present under the coating can facilitate the migration of metallic ions and affect PCB performance. Thus, all residues must be removed from the assembly before applying the conformal coating.

"No-clean" fluxes are also referred to as "low solid" or "low residue" fluxes. These fluxes are designed to leave a benign nonconductive and non-moisture absorbing residue behind, but only if properly heat activated. They are typically Rosin (RO) or Resin (RE) flux types with low (L) or moderate (M) activity levels. It is important to remember that "no clean" actually refers to the electronics manufacturing process where low solid fluxes are used. These electronic assemblies may or may not be cleaned.

No-clean fluxes are typically not very soluble in deionized (DI) water and IPA wash solutions since they are designed to leave behind non-moisture absorbing residues. The white residue left after cleaning a no-clean flux with IPA is essentially dehydrated flux. This white residue has the potential to be conductive and absorb moisture. The

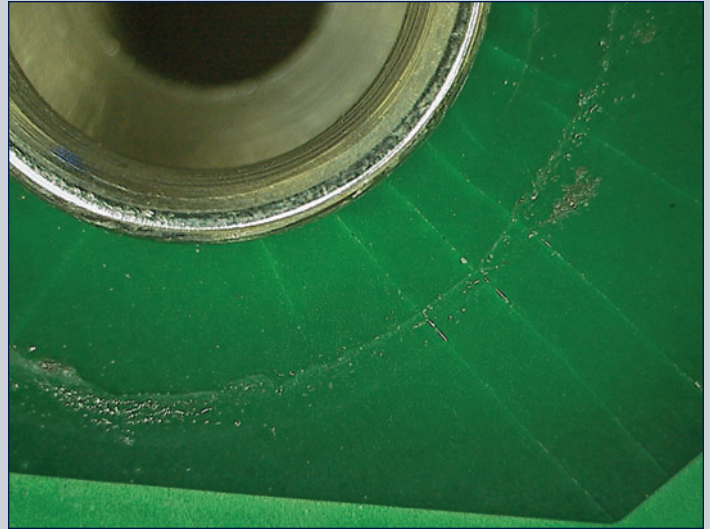
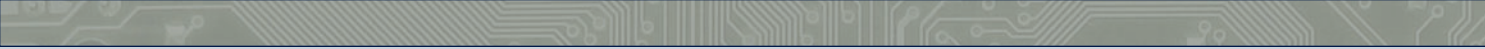


Figure 1: A white residue is often left after cleaning.

recommended cleaning method for no-clean fluxes is the use of saponifier at a 60°C temperature and rinsing with plenty of low pressure steam and DI water. A saponifier is a soap ingredient which reacts with water to split insoluble rosin or resin esters into water soluble salts.

ACI Technologies generally recommends using a flux chemistry other than "no-clean" when the assembly will be cleaned. If a no-clean flux must be cleaned with IPA, the best advice is to add mechanical scrubbing to the cleaning process. Typically, this means the use of a brush and manual scrubbing. Since IPA is such a poor solvent of rosin, a better plan would be to use a solvent based aerosol cleaner. Some brands include Micro Care, 3M, Tech Spray, and Chemtronics. Some technicians prefer aerosol cleaners with "trigger grip" attachments that greatly reduce the amount of solvent required. Each specific flux has some cleaners that work best with them. ACI Technologies advises clients to call their local distributor for some samples and try each on the specific material that requires cleaning, then specify the use of the best material for the job.



ACI Technologies offers various analytical techniques (Resistivity of Solvent Extract (ROSE) Test, Ion Chromatography, Fourier Transform Infrared Spectroscopy, Surface Insulation Resistance) to determine the root cause of contaminant problems and to evaluate the effects of process or materials changes on cleanliness. More information about these services can be found on the ACI website, www.aciusa.org or by calling the Helpline at 610.362.1320.

References

McLaughlin, Malcolm C., and Alan S. Zisman. *Aqueous Cleaning Handbook*. 3rd Edition. AI Technical Communications. 2002.

Munson, Terry. "Can You Clean a No-Clean Assembly?" *Circuits Assembly*. Jan. 2003.

<http://www.residues.com/resources_casestudies.html>.

Munson, Terry. "Is White Residue a Reliability Risk?" *Circuits Assembly*. Jul. 2004.

<http://www.residues.com/resources_casestudies.html>.

Munson, Terry. "White Residues: Are They or Aren't They?" *Circuits Assembly*. Jan. 2006.

<http://www.residues.com/resources_casestudies.html>.

Rebecca Morris
Senior Engineer
ACI Technologies, Inc.



ACI Technologies, Inc. 1 International Plaza, Suite 600 Philadelphia, PA 19113 phone: 610.362.1200 web: www.aciusa.org

Training Center phone: 610.362.1295 email: registrar@aciusa.org

Helpline phone: 610.362.1320 email: helpline@aciusa.org