TECHtips

aci

Electronics Manufacturing Insights from ACI Technologies, Inc.

Reworking ALD Coatings

Atomic layer deposition (ALD) is a process of creating coatings on a molecular layer by layer basis. Using an iterated sequence of self-saturating deposition cycles that are self-terminating, a single layer can be deposited at a time, allowing for highly uniform films with complete conformality. The composition of the film typically used for coating printed wiring boards (PWBs) is a high alumina (Al_2O_3) sequential deposition of alumina and titania capped with a corrosion protective titanium aluminate layer, most notably ALD-Cap from Sundew Technologies, LLC.

Rework is a process of restoring an electronics assembly to full functionality to prolong equipment life and reduce the amount of scrap. The process typically involves:

- identification and removal of a conformal coating
- removing the faulty component through reheating and desoldering
- preparing the lands for resoldering
- repairing any damaged lands, PWB circuits and laminate
- replacement of the conformal coating

These topics are covered in training courses, such as *IPC 7711/7721 - Rework, Repair & Modification of Electronic Assemblies*.

Since the ALD-Cap coating is a new conformal coating process, the topic has not yet been incorporated into the IPC training materials. Unlike other traditional conformal coatings, ALD-Cap coatings do not require mechanical or chemical methods to remove prior to rework. The ALD-Cap film is removed by the melted solder once it is heated to reflow temperatures. The amount of ALD-Cap material incorporated in the new solder joint is minimal, but its effects have not yet been studied in detail.

After the component is removed, an ALD pre-coated component is used as the replacement, as shown in Figure 1. In cases where RoHS materials are exempt, such as in aerospace and defense applications, tin-lead eutectic soldering of the new component is not likely to grow tin whiskers. The component leads are ALD coated except for the area required to form the solder joints. Tin-lead solder has been shown to wet all the way to the coating, as shown in Figure 2, and lead-free solders should wet in a similar

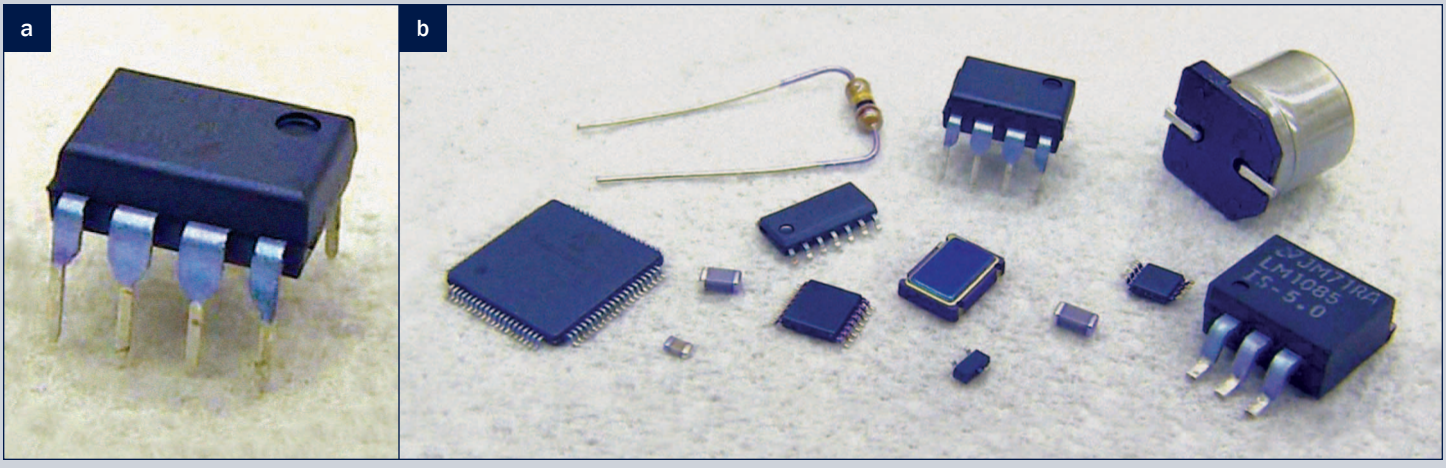

Figure 1: Images of ALD coated components with the solderable surface left uncoated. The ALD coating has a matte appearance while the uncoated region appears glossy. Image courtesy of Sundew Technologies, LLC.

continued on next page

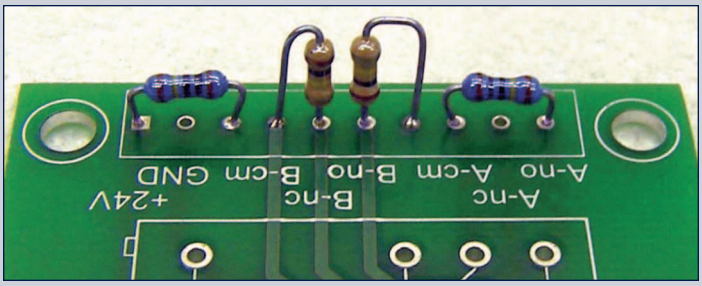

Figure 2: Image of ALD coated through hole components soldered to a board with the solder wetting up to the coated area. Image courtesy of Sundew Technologies, LLC.

manner. In this type of rework procedure, the solder joints of the reworked component will be left exposed, while the rest of the assembly will be fully protected by the ALD-Cap coating.

More studies need to be performed to evaluate the reliability of solder joints that contain dissolved ALD-Cap coating, as well as more rework of components in and out of active boards to confirm the success of the rework strategy and technique.

ACI Technologies can assist with all aspects of board and assembly qualifications, inspections, and failure analysis to determine the quality of solder joints, in addition to the root cause of solder joint failures. ACI can further assist with surface finish analysis, cleaning processes, and cleanliness testing for ionic and organic residues, and engineering services. Contact the Helpline at 610.362.1320, via email to helpline@aciusa.org or visit www.aciusa.org for more information.

ACI Technologies, Inc.