Circuit Boards—Green Residue Always Means Corrosion--Or Does It?

The automatic thinking would be that if you see green residue on a circuit board, you're going to see corrosion underneath. Depending on how serious, corrosion can cause electrical reliability problems.

Commercial water-white rosin is approximately 80% abietic acid and 20% organic acids and doesn't enable reaction of soldering. When heated, abietic acids combine with the oxide on the copper surface creating copper abietic very similar looking to the corrosive products of copper.

Rosin fluxes have small quantities of organic activating agents that cause rosin copper oxide to react and result in better soldering. The activators do not cause corrosion; however they do combine with the copper oxide and form green copper abietate. Unfortunately, this green residue cannot easily be distinguished from the corrosion products of copper.

A study that tested heat and humidity using coupons suggested that certain green copper/flux residues do not always cause or mean corrosion or definite decreased circuit reliability. Even though some liquid and solder paste fluxes showed high SIR values in testing and left green residues on copper surfaces after soldering, heat exposure or high humidity—the copper surfaces beneath the residue appeared shiny and not pitted and—not corroded. However, some green residues do indicate corrosion, but not always.

Take the PCB Corrosion Quiz

Part 1- Multiple Choice

1. Which of the following is not a form of corrosion?

a) Electrochemical migration
b) CAF
c) Solder dross
d) Dendritic growth
e) Creep corrosion
f) None of the above

2. What causes corrosion?

a) Operating environments
b) Halides – mainly bromides, chlorides, sulfides and fluorides
c) Halide-free PCB fab and/or assembly chemical residues
d) All of the above
e) None of the above

3. How does corrosion affect electronic assembly performance?

a) Creates no operational interference
b) Causes intermittent functionality problems
c) Completely disables electronic assemblies
d) Any of the above
e) None of the above

Part 2– True or False?

4. Most analytical labs can provide root causes analysis for corrosion.

5. Residual PCB fabrication and assembly chemicals are rarely the root causes of corrosion.

6. IPC standards dictate cleanliness levels for PCB fabrications and assemblies.

7. Proper cleaning will prevent many forms of electrochemical corrosion.

8. Conformal coating will help prevent environmental corrosion.

Part 3 – Multiple Choice

9. What are the best conformal coatings to ward off corrosion?

a) Urethanes
b) Silicones
c) Acrylics
d) Epoxies
e) Parylene

10. How do you ensure conformal coatings completely cover the desired area?

a) Visual inspection with 10X ring light or magnifier
b) Immersion test
c) UV inspection
d) Automated Optical Inspection (AOI)
e) None of the above

Answers – 1. C, 2. D, 3. D, 4. False, 5. False, 6. False, 7. True, 8. True, 9. Any of the above, 10. C or D

Scoring – 8-10 correct (Corrosion expert); 0-6 correct (Need more training)

Based on the original quiz - What's Your PCB Assembly IQ?