

TEST PROCEDURES FOR DETERMINING THE AMOUNT OF TIN WHISKER FORMATION

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Tin Whiskers

As the electronic industry moves to eliminate lead from product, pure tin coatings have become the common replacement for tin-lead surface finish. Tin finish can cause problems not seen with tin-lead, namely whiskers.



Figure 1 –SEM photograph of whisker formed on tin plated lead

Tests

There are several tests that should be conducted to determine the plating's tendency to form whiskers. This testing is best used as a comparison of new potential finishes.

The following are the recommendations of Trace Laboratories – East for determining the likelihood of tin whisker formation on pure tin platings and soldered assemblies. The test samples can be almost anything - bare printed circuit boards with pads plated in tin or new tin-plated components before they are soldered to a board or a finished soldered assembly or part (harness assembly, cable, etc.) or a test coupon designed specifically for this test.

- Initially examine each of the pads/leads/joints for tin whiskers.
- Perform Screening Inspection at greater than 50X.
- If whiskers are detected, perform Detailed Inspection via Scanning Electron Microscopy (SEM) to locate whiskers. This examination is performed at approximately 300X to locate whiskers.
- Photograph at approximately 3000X to measure and record the maximum length of whiskers and whisker density.
- General requirement is that whiskers shall not exceed 10µm for high reliability products and 25µm for consumer products before or after being subjected to the following conditions.

Ambient Temperature/Humidity Storage Testing

Condition samples at 30°C and 60% RH for 4,500 hours (approximately six (6) months). Examine samples at 0, 1500, 3000, and 4500 hours. Perform either the Screening or Detailed Inspection at each interval for tin whisker growth as listed above.

High Constant Temperature Testing

Condition samples at 60°C and 93% RH for 4,500 hours (approximately six (6) months). Examine samples at 0, 1500, 3000, and 4500 hours. Perform either the Screening or Detailed Inspection at each interval for tin whisker growth as listed above.

Temperature Cycling

Condition samples at +85°C to -40°C for 1,000 cycles with three (3) cycles per hour. Examine samples at 0, 500, and 1000 hours. Perform either the Screening or Detailed Inspection at each interval for tin whisker growth as listed above.

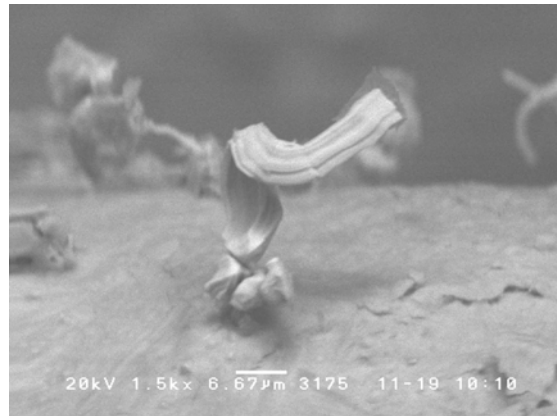


Figure 2 - SEM photograph of whisker formed on tin plated lead

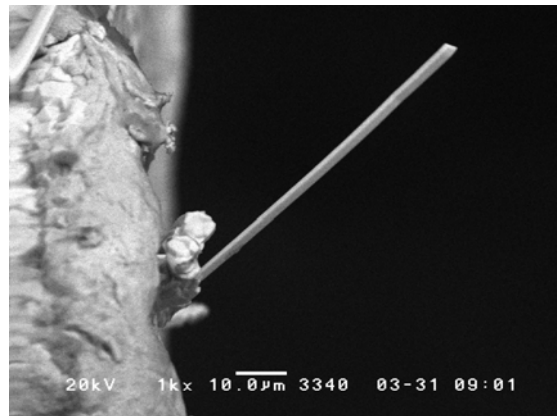


Figure 3 - SEM photograph of whisker formed on tin plated lead

Conclusions

As new processes are implemented, new means of testing must be employed. At Trace Laboratories – East, we specialize in taking existing standard test methods and modifying them to better suit our customer's needs.

For more information concerning these topics or any other testing needs, please contact me at (410) 584-9099 (traceeast@tracelabs.com) or (303) 683-4806 (tracedenver@tracelabs.com). Visit us on the web at www.tracelabs.com/east.aspx.