IPC Midwest 2011

Analytical Procedures for Portable Lead-Free Alloy Test Data: State of Merge of iNEMI and SPVC Documents

Greg Munie, Ph.D.

IPC

Executive Summary:

The IPC Solder Products Value Council, in cooperation with iNEMI and a group of industry experts, has developed a protocol for testing the physical properties of lead free solder alloys. This presentation will review the status of the protocol's development, the status of a round robin of the protocol's test repeatability and then briefly discuss the prospect for developing better reliability models using creep data testing as described in the protocol.

Analytical Procedures for Portable Lead-Free Alloy Test Data: State of Merge of iNEMI and SPVC Documents

Greg Munie

IPC

Why new “Alloy Test Method(s)?”

- Describes material tests that generate portable data
  - Apples to Apples comparisons between different sites
- Allowing for
  - direct comparison of different alloys
  - aiding in alloy acceptability determination for various applications,
  - development of reliability models

Goal

- To allow user to switch alloys on the basis of manufacturing need (a soldering “fix”) without reliability testing (ATC) every alloy
- Premise: If all physical properties of two alloys are the same within experimental limitations then it is probable that their reliability behavior in ATC will be the same
- This premise is based on input received from SMEs and published lead free reliability models

From IPC APEX 2011 Meeting

- iNEMI's Table 2.1 (on metal contamination levels) is in the document
- iNEMI's NIST based procedure for determining melting temperature and controls are now the test procedure
- Wetting test is now 003 only!
- CTE follows iNEMI recommendations

From IPC APEX 2011 Meeting

- SPVC dynamic modulus used
- iNEMI additional (optional) tests added

iNEMI June 28, 2011 Response to IPC Draft

- Release document without a copper dissolution test at this time.
- Release the Basic Material Property Testing document without a creep test at this time.
- Refer to J-STD-002 rather than J-STD-003 as the method for wetting balance testing, as recommended by the SPVC.

iNEMI June 28, 2011 Response to IPC Draft

- Finalize the joint SPVC-iNEMI Basic Material Properties document as soon as possible and submit it to the appropriate committee within IPC
  - Binding standard (preferred)
  - Guideline (if necessary)
  - Not a white paper (already done).

Open Items

- Copper dissolution
- Creep testing
- J-STD-002 to replace J-STD-003 in SPVC document
- Confirmation of sample prep method

IPC Sample Preparation Round Robin: In Progress

Is the chosen sample method reproducible?

- Lowest common denominator/first place to start
- Auburn developed test method to be used
- Three sample preparation locations
  - Auburn
  - Benedictine University
  - Robisan

Sample Prep Round Robin

- Standard SAC 305 alloy provided by Cookson
- Glass sample tubes to be provided by Auburn (pre-tested for defects)
- Three locations will make 50 samples each for tensile testing by three (yet undetermined) test sites.
- Blind distribution of samples

Sample Prep Round Robin

- Tensile testing appears to be the easiest physical test
- Statistical analysis of test data should reveal:
  - Reproducibility of sample preparation by preparing location
  - Reproducibility of sample testing by test location

Open Items

- J-STD-002 to replace J-STD-003 in SPVC document (edit change only)
- Confirmation of sample prep method (in progress)
- Copper dissolution
- Creep testing

Copper Dissolution and Creep

- Procedures already in document using
  - NIST Special Publication 960-8, Section 13, “Liquid Solder Dissolution.”
  - National Physical Laboratory REPORT DEPC MPR 021 “The Measurement of Creep Rates and Stress Relaxation for Micro Sized Lead-free Solder Joints.”

When do we move on to these round robins?

(ASAP?)

Questions?