

Hermeticity Testing, RGA and Near Hermetic Packaging

1 DAY

Hermeticity of electronics packages including hybrids, microwave modules, MEMS, Class III medical implants continues to be of critical importance. This course begins with an overview of hermetic sealing processes and then examines the accepted leak test techniques as prescribed in MIL-STD-883 Test Method 1014. Issues with bomb times and pressures, measured leak rate vs. air leak rates, "one way leakers", virtual leakers will be addressed, along with gross leak testing. In each case the focus will be on practical issues facing the industry. The basic science and applicability of both Optical Leak Test (OLT) and Cumulative helium Leak Detection (CHLD) will be described with plenty of time for questions. The gas ambient inside the package is measured using Residual Gas Analysis. What is RGA (Residual Gas Analysis)? How does it relate to hermeticity testing? Packages made from polymeric materials as opposed to traditional hermetic seals (i.e. metal, ceramic etc.) require a different approach from a testing standpoint. The problem is now one of moisture diffusion through the barrier and package interfaces. A brief review of the techniques and methods to evaluate a "non-hermetic" approach is presented.

This course is intended as an introductory to intermediate level course for process engineers, designers, quality engineers, and managers responsible for seal, leak testing and RGA results and for those responsible for evaluating new cavity style packages.

Course Outline

What is Hermeticity?

Hermetic Seal Materials and Processes

- Seam welding, solder seal

- Laser welding aluminum and Al-Si alloys

- On wafer MEMS seal processes

Hermeticity Testing per MIL-STD-883 TM 1014 (SEAL)

- Space and military hermeticity requirements

 - Impact of tighter leak rate specifications

- Theory and technical basis of hermeticity testing

 - Air leak vs. measured helium leak rate

- Helium Fine Leak Testing

 - Fixed vs. flexible method

- Gross Leak Testing

 - Bubble test, dye penetrant etc.

- Other hermeticity test methods

 - Optical Leak Testing (OLT)

 - Cumulative Helium Leak Testing (CHLD)

 - Kr-85 Radioisotope based methods



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Residual Gas Analysis (RGA) per Mil-Std-883 TM 1018 (IVA)

Space and military RGA requirements

Theory and technical basis for RGA testing

Moisture problems in microelectronics

Outgassing in hermetic packages

Pre-bake process parameters and effect on RGA results

Particle, moisture, and hydrogen getters

“Near- Hermetic Packaging” and Testing Issues

Qualification of near hermetic packages for military applications

Ficks law of moisture diffusion

Moisture sensors

Course Summary

Student Examination Test and Review

Student Feedback and Course Critique

Note: In addition to the comprehensive set of course notes each student receives a "Practical Guide to TM 1014," authored by the instructor. Recommended textbook; “Hermeticity of Electronic Packages” by Hal Greenhouse (Noyce Publications 2000)