ONEIDA RECHERCHE SERVICES
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INTERNAL VAPOR ANALYSIS OF HERMETIC DEVICES

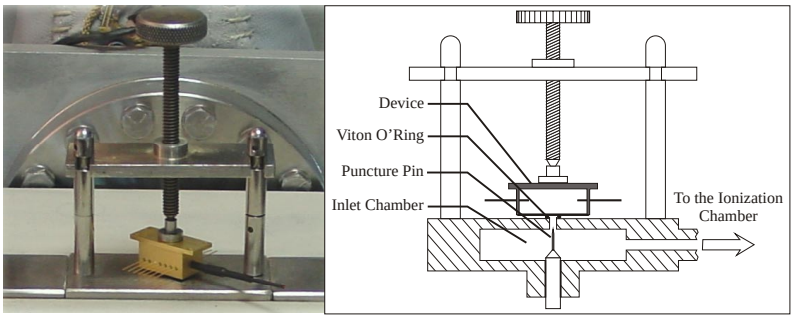
Internal Vapor Analysis (IVA™) is a complete quantitative and qualitative analysis of the ambient gases contained within the cavity of hermetic devices. IVA technology determines the relative volumetric concentrations of all the substances in the vapor state at the time of the test.

Historically, internal vapor content analysis of hermetic devices was developed for the purpose of detecting and monitoring moisture related failures of hybrids, ICs and relays used in military applications. Universally known as Residual Gas Analysis (RGA), its purpose was solely to quantify moisture with a pass/fail criteria of 5000 ppmv. The associated procedure is documented in *Mil-Std-883, Method-1018* "*Internal Water Vapor Content*".

ORS developed the Internal Vapor Analysis test (IVA) to meet the current market expectations for improved measurement accuracy, increased flexibility for specific application testing and enhanced reliability requirements of hermetic devices. The IVA test method is more versatile and extends the scope and requirements of traditional RGA. The main advantages are increased instrument performance specifications, more rigorous calibration requirements and the flexibility to adapt test conditions to meet the specific needs of a particular application. The *ORS SOP Mel-1053* defines the frame of the IVA test.

Various manufacturing standards refer to IVA/RGA as the analytical technique to quantify the internal water vapor content. For example, the rigorous Telcordia documents (GR-1221 & 468) which detail packaging standards for the Telecommunications industry specify a moisture limit of 5000 ppmv.

Technically, the test is performed using a specialy designed Quadrupole Mass Spectrometer. This analytical technique involves the ionization and separation of gas molecules as they flow from the package cavity followed by a measurement of their relative abundance (ppmv) as a function of their mass-to-charge ratio (m/z).
As shown, devices are loaded on the instrument one at a time. The inlet chamber is then subjected to high vaccum before the pin punctures the device, thereby releasing the gaseous content into the system.



test sequence : after positionning the device, the puncture pin is driven through the package lid. The gas contained in the cavity then flows into the system for analysis.

The IVA test method proves to be a powerful multipurpose technique which adresses the needs of high-technology industries such as Defense, Aerospace, Microelectronic, Optoelectronic, Micromechanisms (MOEMS/MEMS), Frequency, Medical and Lighting :

IVA test as a *DEVELOPMENT TOOL*

- seal integrity → *hermeticity loss, one-way leakers phenomenon, …*
- humidity concentration → *corrosion, metallic migration, …*
- sealing gas composition and purity → *N_2 purity, He backfill percentage, …*
- cleaning process effectiveness → *solvent traces, …*
- stability of materials → *outgassing, decomposition, …*

IVA test as a *SUPPORT & QA TOOL*

- research & development
- final product qualification
- process control
- failure analysis
- incoming inspection

examples of *DEVICES*

- laser pump
- laser diode
- optical switch
- WDM
- CCD
- oscillator & quartz
- pacemaker
- hybrid & MCM
- relay
- mylar bag
- light bulb

Used on a regular basis or for problem solving, the Internal Vapor Analysis test proves to be a cost effective solution to improve and ensure the reliability of hermetic devices.