

Add-on services



HIGHLIGHTS

General Features

- Fast engineering service
- High throughput equipment
- Class 100 clean room operation
- Process/material customization
- Competitive costs

Applications

- MEMS gyro
- MEMS resonators
- Microbolometer – IR sensors
- MEMS Pressure sensors
- X-Ray detectors
- MEMS atomic clocks
- MEMS seismic sensors

SAES provides a powerful service pack to support customers in the selection and engineering of materials and components to be used as packaging elements, as well as characterization techniques to determine the quality and reliability of hermetic sealing.

Engineering of materials and components

Through different analytical capabilities, SAES can support customers in the selection and optimization of components. The vacuum compatibility of components and materials to be used in vacuum packaging can be investigated thanks to dedicated equipment at the state of the art. Critical components that typically require analyses are ceramic containers, lids or windows and die attach materials (especially epoxy resins).

SAES' typical characterization techniques for packaging:

- TG-DSC (thermo gravimetry- differential scanning calorimetry): a particular kind of thermal analysis very useful for die attach materials. It assess the thermal stability properties of die attach materials in relation with vacuum and bonding temperature requirements.
- Outgassing test: a dedicated vacuum analysis to quantify the amount of gases released by packaging components. Container and lid are analyzed to check the quality and amount of gas released by their surfaces during heating in vacuum and to determine if the released gases are getterable elements or not.

Typical outgassing result for ceramic components.

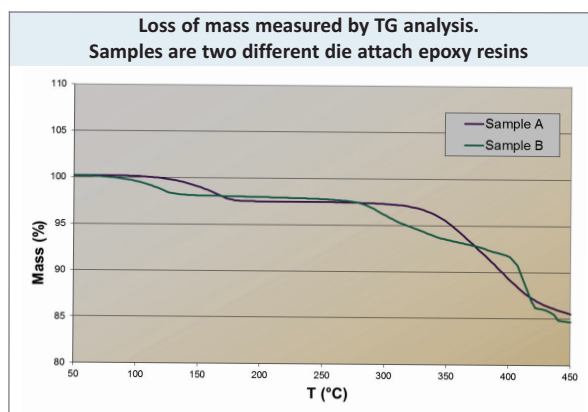
Gas	LCC-type (mbar·cm ³)
H ₂	3.73·10 ⁻¹
CO	-
N ₂	8.21·10 ⁻³
H ₂ O	1.88·10 ⁻³
O ₂	-
CO ₂	2.66·10 ⁻²
Noble gases	1.21·10 ⁻⁵
Organic Compounds	9.92·10 ⁻³
TOT.	4.20·10⁻¹

Gas	No thermal treatment (mbar·cm ³)	SAES' thermal treatment (mbar·cm ³)
H ₂	4.92·10 ⁻²	3.91·10 ⁻³
CO	-	-
N ₂	-	-
H ₂ O	3.88·10 ⁻⁵	-
O ₂	-	-
CO ₂	5.11·10 ⁻²	1.58·10 ⁻³
Noble gases	1.29·10 ⁻⁵	8.83·10 ⁻⁷
Organic Compounds	1.56·10 ⁻²	9.30·10 ⁻⁴
TOT.	1.16·10⁻¹	6.42·10⁻³

Outgassing results for packaging components without and with specific thermal treatments.



- Head Space GC-MS: a very sensitive technique for VOCs detection. VOCs can be released by epoxies or contaminated materials and are generally detrimental for vacuum performances during and after the sealing. The detection limit extends to ppb level.



Hermetic sealing characterization

The quality of hermetic sealing, in terms of vacuum level and hermeticity, can be effectively determined by additional analyses that are complementary to the previous ones.

Sealing quality and validation are achieved through the following techniques:

- Residual Gas Analysis: gas composition assessment and measurement of partial pressure of each gas inside the closed package. Vacuum sealing or leaky sealing can be checked as well.

Gas	PageLid® (mbar)	No PageLid® (mbar)
H ₂	-	1.37
CO	-	1.81
N ₂	-	-
H ₂ O	-	1·10 ⁻²
O ₂	-	-
CO ₂	-	1.50
Noble gases	4.05·10 ⁻⁷	9·10 ⁻⁷
Organic Compounds	5.12·10 ⁻⁴	7.98
TOT.	5.12·10⁻⁴	12.76

- Leak Rate analysis: determination of the hermetic level of the sealing frame and lifetime predictions. The analysis establishes whether the device is affected by a leak or not and quantitatively measures the leak rate. Sensitivity of the measurement is about 2·10⁻¹⁶ mbar·l·s⁻¹.

Hermetic level of SAES' packaging service: LCC-type container, Kovar lid and AuSn preform.

Leak rate (mbar·L·s ⁻¹)	Total pressure after 10 years (mbar) <i>assuming leak rate as below</i>	
	With PageLid® (noble gases residual)	Without PageLid®
5·10 ⁻¹⁴	0.003	0.316
5·10 ⁻¹³	0.032	3.156
1·10 ⁻¹²	0.063	6.311
SAES' process (<10 ⁻¹⁵)	<10 ⁻⁴	-

Add-on services

The SAES Group manufacturing companies are ISO9001 certified, the Asian and Italian companies are ISO14001 certified also. Full information about our certifications for each company of the Group is available on our website at: www.saesgroup.com

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