High Porosity Thin Film Getters - HPTF

MEMS packages requiring vacuum to operate and flat panel displays created the need of a new generation of sintered porous non evaporable getters with following unique characteristics:

- Available in planar form and with a total thickness of few hundreds microns
- With a high active surface area but also an excellent mechanical strength
- Activatable at temperatures in the 300-500°C range and capable to exhibit high sorption performance at room temperature
- Manufacturable in an almost infinite variety of custom configurations

HPTF getters are the getter solution developed by SAES to comply with these new market requirements. The getter consists of a highly porous, mechanical stable, getter coating on a metallic substrate

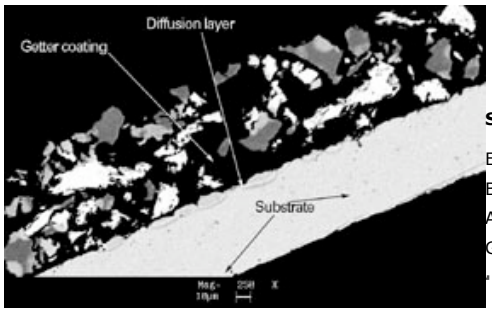
The getter coating is deposited onto the metallic substrate by means of a special screen printing process that is typically performed through metallic masks on chem-milled substrates. These coatings are then sintered under vacuum at high temperature thus achieving a mechanical consolidation and a perfect adhesion of the getter material to the substrate due to the formation of a diffusion layer at the interface.

Although, in principle, different metals or metallic alloys can be used as substrate, nicrofer, a nickel-chromium-iron alloy in a thickness of 50 microns, is the only substrate used for all HPTF getters.

HPTF getters can be activated in a direct way by passage of electrical current but typically bake-out and process temperatures are enough to make them active.

St122, a mixture of titanium and St707, a SAES Zr-V-Fe gettering alloy, is the gettering material normally used in HPTF getters and the only one that has proved to properly work in MEMS packages and flat displays: in fact St122 becomes active at temperatures from 300 to 500°C that are compatible with the manufacturing processes of these devices.

HPTF getters can be supplied also with a different gettering material, St121, a mixture of titanium and St101, that gives advantages with respect to St122 only after high temperature activations at 750°C. On the other hand St121 cannot be activated at temperatures lower than 500°C and this limits its use only to traditional electron tubes where high temperature activations can be easily tolerated.



St122 - Physical Properties

Emissivity: 0.60 to 0.65
Bulk Density: 4.7 g/cm^3
Apparent Density: 2.0 +/- 0.3 g/cm^3
Getter Mass per cm^2 : 20 mg (100µm thickness)

Applications

FEDs	The FED application presents a most challenging environment for getters. HPTF getters have been optimized for this application. Typically, the getter is sealed into the package in a vacuum process. The cathode and anode structures are held apart to allow for outgassed species to be removed by the process pump. The getter is activated during the sealing process. Typical frit-seal times, in the range of 400°C to 430°C for about a half hour or more, are sufficient to fully activate the getter. The quantity of getter required is dependent on the outgassing of the materials in the display, as well as the processing of those materials.

PDPs	The PDP (Plasma Display Panel) application presents very different requirements on the getter from one where high vacuum is required. The role of a getter in PDPs is that of an in-situ pump. The getter, unhampered by the conductance of the pumping tube, works with the process pump to pump down the display before backfill and pinch-off. The getter shortens the time that the process pump needs to be connected to a display. It is also present during the life of the display, and can minimize the effects of outgassed contamination.
MEMS	Successful application of HPTF getters in MEMS devices requires a full activation of the getter to maximize its efficiency. A typical process would consist of prebaking the package before die attach in order to reduce the amount of hydrogen that could outgas. This hydrogen is entrained in the electroless gold metallization common to standard packages. Such bakeouts can be performed for an hour at a pressure of 10^{-5} to 10^{-6} torr. When the package is ready for final sealing, the getter should be activated first in order to gain maximum performance before sealing. SAES Getters has worked with equipment vendors to develop a turnkey sealing and activation process.
Other	HPTF getters can be used anywhere a thin, highly efficient getter is required.

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