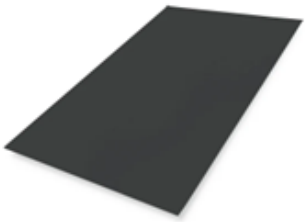
NANOFEA

NANOMAX
Getters Reimagined

SilMAX

Flexible Heritage Hydrogen Getter Sheets

SilMAX materials are designed to be a form, fit and function replacement for heritage hydrogen getter sheet applications.



SilMAX		
Product	**Operating Temperature**	**Capacity**
SilMAX	Flexible from -55°C to 150°C. Thermally stable to 200°C.	45 atm.cc/g of H_2

NanoFEA (Nano Functionally Engineered Atmospheres) understands that that many applications are built around existing getter technologies. As good as our NanoMAX getters are, there are times when qualifying new solutions is prohibitive. SilMAX is a rigorous interpretation of the classic KCP high-capacity H_2 getters used for scavenging outgassed hydrogen gas from packaging materials (polymers, epoxies, PCBs and Ni/Au plating etc.) SilMAX's proven redox chemistry provides a robust defense against outgassed hydrogen, effectively preserving device performance and ensuring reliable operation over lifespans from years to decades.

Typical Applications:

- MEMS-based inertial sensors and gyros
- Photodiode and image sensor packages
- Implantable pacemakers and stimulators
- Optoelectronic modules (VCSELs, laser diodes)
- Space/aerospace avionics packages

H_2 getters are essential in maintaining the long-term stability and performance of sealed microelectronic, photoelectronic, and medical device packages. The following outlines SilMAX critical advantages:

1. Prevents Hydrogen Induced Failure	Absorbs Outgassed Hydrogen that can cause metal corrosion, delamination, dielectric breakdown and functional drift
2. Maintains Package Integrity	Prevents internal pressure build-up from hydrogen accumulation, minimizing risk of lid bulging or cracking
3. Stabilizes Optical Components	Protects sensitive coatings, laser diodes and photodetectors from hydrogen related performance degradation
4. Enhances Vacuum and Inert Gas Environments	Maintains low pressure or controlled gas compositions in IR sensors, MEMS and image sensors.
5. Ensures Longevity and Reliability	Enables 10 to 20 year+ service life in mission critical and implantable systems by removing reactive hydrogen.
6. Compatible with Miniaturization	Especially effective in compact packages with limited internal volume where trace hydrogen has amplified effects.
7. Mitigates Material Outgassing Effects	Adsorbs hydrogen released from adhesives, polymers, and internal corrosion without requiring complex degassing procedures
8. Biocompatibility Support	Protects implanted medical devices from hydrogen induced anomalies that may impact sensors or electronic function.

NanoFEA, LLC 4245 N Central Pkwy, #490, Dallas, TX 75205 email: Sales@nanofea.com Ph: +1(720)703-4622

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Using SilMAX

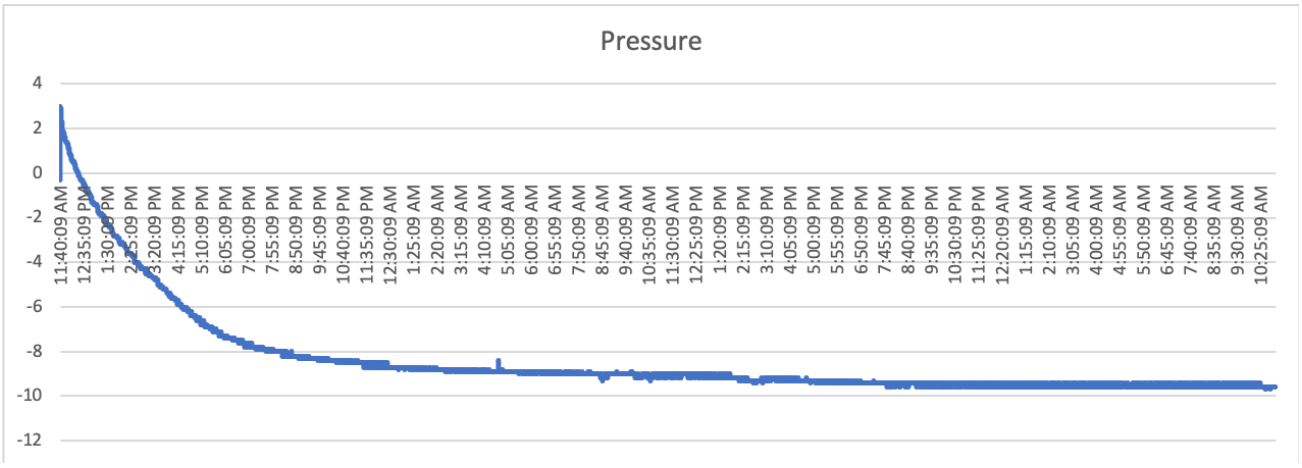
Using SilMax is easy. Use it just like you use your current hydrogen sheet getter. Order the desired thickness and quantity, cut to shape, and attach it to your device using the silicone compatible adhesive of your choice.

SilMAX, like most legacy getters, needs activation to perform properly. Getter activation requires temperatures above 100C in a dry or vacuum ambient. A very conservative activation profile in common use in industry is to expose the getter to rough vacuum at 150C for a minimum of 16 hours. Activation profiles with lower temperatures/time/in air are possible. We are happy to assist you in integrating SilMAX into your package.

Sizing SilMAX

Sizing SilMAX for electronic packaging applications is easy. When no data is available quantifying the hydrogen outgassing rates in a package, NanoFEA uses a design rule derived from long term data provided by Oneida Research Services. This data points to a 90th percentile maximum concentration of 25,000 ppmv. Our practical experience suggests that a factor of safety (FOS) of 2, catches the inevitable outliers. For more discussion on this design rule please contact us.

SilMAX Performance



Example hydrogen sorption curve by delta P for a SilMAX getter activated in vacuum at 150C for over 16 hours. The test was run for 47 hours until the end point was called. The hydrogen capacity at end point for this sample is:

38.18 torr-liter/g
50.23 atm.cc/g
38181.82 cc-torr/g

The average sorption speed over the duration of the test is 0.81 torr-liters/hour or 1.07 scc/hour. This rate greatly exceeds the typical hydrogen outgassing rates experienced in microelectronic packages.

When Reliability and Product quality are paramount, look no further than NanoMAX – We're Getters Reimagined

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