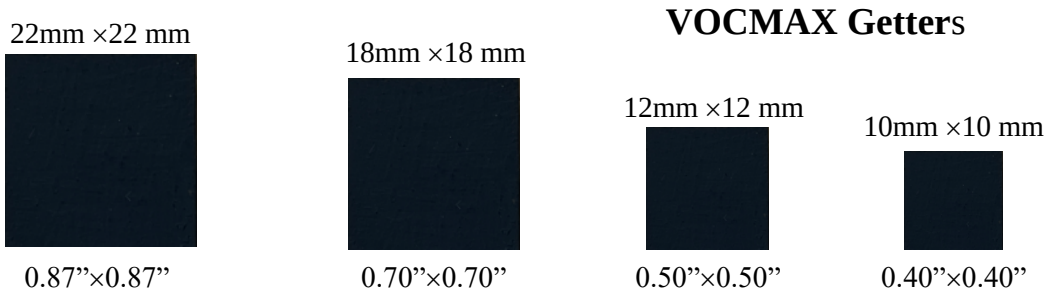
NANOFEA

NANOMAX
Getters Reimagined

VOCMAX Getters
(Vacuum Systems/Optic/MEMS/Hermetically Sealed Packages)



NanoFEA (Nano Functional Engineering Atmospheres) has designed and developed a series of multifunctional nanomaterials for absorbing a variety of organic hydrocarbons and volatile organic compounds (VOCs). These hierarchically porous nanostructured materials are specifically designed to absorb harmful polar VOCs (Acetone (C_3H_6O), Ethanol (C_2H_6O), Methanol (CH_4O), Formaldehyde (CH_2O), etc.), non-polar VOCs (such as Benzene (C_6H_6), Toluene (C_7H_8), Xylene (C_8H_{10}), Hexane (C_6H_{14}), Ethane (C_2H_6), etc.). They are intended for use in demanding and challenging vacuum equipment or hermetic packaging systems. NanoMax material based VOCs absorption getters offer a cost-effective solution, which has been patented as disclosed in US Patent Application# 2025/0073666 A1 and 2025/0091030 A1.

The VOCMAX hierarchically porous nanostructured materials provide a novel method for gas absorption in vacuum equipment and hermetic packaging systems. These harmful gas substances can degrade vacuum levels, impair measurement accuracy in vacuum equipment or instruments, and affect the reliability of long-term measurement data.

Benefits of VOCMAX Getters

- **Capable of absorbing polar hydrocarbons and volatile organic compounds (VOCs)** (e.g., Acetone (C_3H_6O), Ethanol (C_2H_6O), Methanol (CH_4O), Formaldehyde (CH_2O), Acetaldehyde (C_2H_4O), Isopropanol (C_3H_8O), Methyl Ethyl Ketone (C_4H_8O), Ethyl Axetate ($C_4H_8O_2$), and Ethyl Axetate ($C_4H_8O_2$)) and
- **Capable of absorbing non-polar hydrocarbons and VOCs** (e.g., Benzene (C_6H_6), Toluene (C_7H_8), Xylene (C_8H_{10}), Hexane (C_6H_{14}), Ethane (C_2H_6), Propane (C_3H_8), Styrene (C_8H_8), Ethylbenzene (C_8H_{10}), Methylene Chloride (CH_2Cl_2), and Trichloroethylene (C_2HCl_3)).
- **Various Sizes**: Offers standard and custom sizes to fit any packaging requirement.
- **Lightweight and Low Profile**: Ensures excellent performance without adding bulk.
- **Easy Application**: Can be applied to any surface using high-temperature adhesive films or epoxy resins of your choice.
- **Wide Temperature Range**: Functions efficiently from -55°C to +300°C.
- **No Activation Required**: Ready to use without activation or regeneration.
- **Long Shelf Life**: Maintains effectiveness for up to 2 years from the date of purchase.

sales@nanofea.com +1 (720) 703-4266
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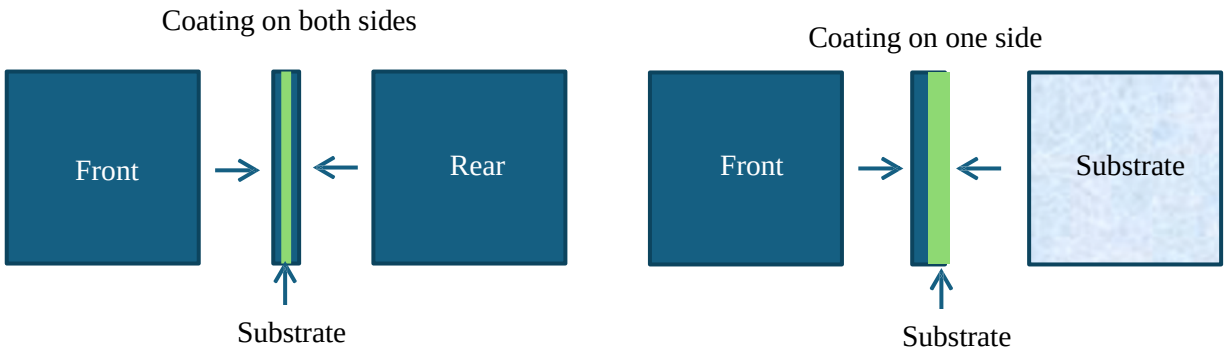

Substrate materials: Glass (borosilicate glass and silicate glass), ceramics (alumina, purity 92-99%), metals (titanium (Ti), copper (Cu), Kovar alloy, aluminum alloy).

Material Physical Properties:

Density: 0.95±0.15 g/cm^3

Dielectric constant: 2.4±0.1

Thermal conductivity: 0.25±0.05 W/m·K

Coefficient of thermal expansion (CTE): 25±5 ppm/^{o}C

Young's modulus: 0.1±1.5 GPa

Electric Insulation resistance: 10^{12} – 10^{14} Ω·cm

Surface energy: 35-45 mJ/m^2

The appearance of the material: Colors – Gray to off-white, light black, and black

Prime Polar Organic VOCs

Acetone (C_3H_6O)	21.0
Ethanol (C_2H_5OH)	24.0
Methanol (CH_3OH)	25.0
Formaldehyde (CH_2O)	21.0
Acetaldehyde (C_2H_4O)	22.5
Isopropanol (C_3H_8O)	21.0
Methyl Ethyl Ketone (C_4H_8O)	19.0
Ethyl Axetate ($C_4H_8O_2$)	17.0
Methane (CH_4)	12.5
Ethylene (C_2H_4)	10.0
Moisture/Water vapor (H_2O)	(10-20)/(30-40)

Prime Non-polar Organic VOCs

Benzene (C_6H_6),	15.0
Toluene (C_7H_8),	17.5
Xylene (C_8H_{10})	19.0
Hexane (C_6H_{14})	17.0
Ethane (C_2H_6)	10.0
Propane (C_3H_8)	12.5
Styrene (C_8H_8)	18.5
Ethylbenzene (C_8H_{10})	19.0
Methylene Chloride (CH_2Cl_2)	15.0
Trichloroethylene (C_2HCl_3)	18.5
Moisture/Water vapor (H_2O)	10-20

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The size and thickness of a getter are determined by its length, width, and thickness. As shown in the table below, standard getter dimensions include 0.87” × 0.87” (22 mm × 22 mm), 0.70” × 0.70” (18 mm × 18 mm), 0.50” × 0.50” (12 mm × 12 mm), and 0.40” × 0.40” (10 mm × 10 mm). Customized sizes are also available upon request. The adsorbing material typically comes in two thicknesses: 350 ± 10 µm for double-sided coatings on the substrate, and 300 ± 10 µm for single-sided coatings. For example, if the adsorption capacities for moisture and VOCs are known to be 20 wt% and 15 wt%, respectively, a getter with dimensions of 0.87” × 0.87” can adsorb 15 mg of moisture and 11.3 mg of VOCs. To ensure a safety factor of 10, an electronic package may allow a maximum outgassing quantity of 1.5 mg of moisture and 1.13 mg of VOCs over 20 years of operation. The actual adsorption quantity is determined by the capacity at a specific temperature, humidity, and partial pressure.

Standard Getter Sizes	Type of Getter Coating	Adsorption Material Weight (mg)	Adsorption Layer Thickness (µm)	Getter Weight (g)	Getter Thickness (µm)	15 wt% VOCs Adsorption (mg)	20 wt% Moisture Adsorption (mg)
0.87"x0.87"	Double sides	75	150	0.285±0.005	350±10	11.3	15.0
	Single-side	50	100	0.260±0.005	300±10	7.5	10.0
0.70"0.70"	Double sides	50	150	0.200±0.005	350±10	7.5	10.0
	Single-side	35	100	0.185±0.005	300±10	5.3	7.0
0.50"x0.50"	Double sides	25	150	0.096±0.005	350±10	3.8	5.0
	Single-side	15	100	0.086±0.005	300±10	2.3	3.0
0.40"x0.40"	Double sides	15	150	0.065±0.005	350±10	2.3	3.0
	Single-side	10	100	0.060±0.005	300±10	1.5	2.0

Pre-use preparation: To eliminate adsorbed moisture from the getter prior to package installation, heat the getter at 80–100°C for 24–72 hours under vacuum conditions (<10^{-5} Torr). After this treatment, perform a dry N_2 or Ar purge to prevent re-adsorption of moisture before assembly.

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