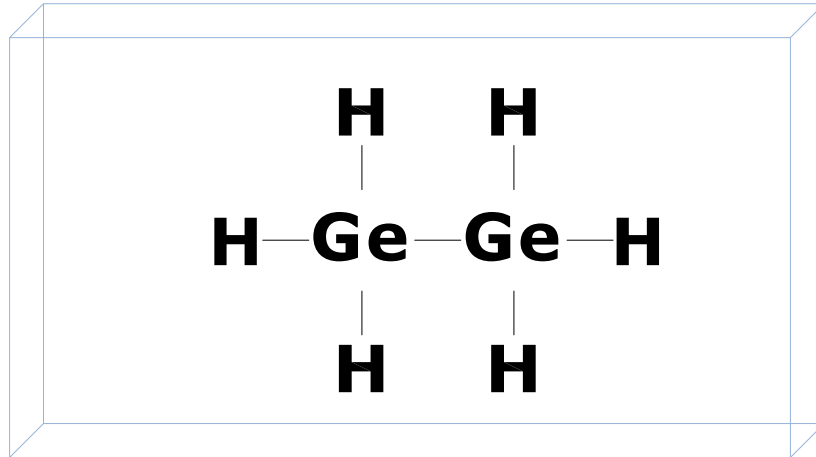


Metaloids makes and supplies digermene to the microelectronics, photonics and photovoltaics industries. Our mission is to research, synthesize, purify, qualify and package challenging process gases to enable economic manufacturing of high performance electronic devices. We welcome customer feedback and collaboration as critical guides to innovation in our industry. USPTO 7,591,985.



Applications:

Digermene is a higher density source of hyper-pure germanium in the chemical vapor deposition and molecular beam epitaxy of amorphous germanium layers, silicon-germanium (SiGe) and boron-germanium alloys. The first practical integrated circuit was fabricated using germanium as semiconductor by Nobel Laureate Jack Kilby in 1958. By virtue of a larger atomic radius, germanium induces strain in adjacent layers of silicon, thereby increasing the mobility of charge carriers in silicon, which in turn, improves performance and power consumption in microprocessors. This basic discovery makes germanium important for high performance complementary metal oxide semiconductors and SiGe technologies associated with heterojunction bipolar transistors for high speed digital communications such as broad band and cell phones. Other applications include photon detectors, solar cells, quantum dots and LEDs.

Our Capabilities:

Statistical process and quality control systems in our operations enable higher yields, improved selectivity and consistent purities. Metaloids networks with qualified distributors to reach customers. We are a team and process technology driven organization that understands the health, safety and environmental aspects of specialty chemical plant operation.

Physical Properties:

Digermene (Ge_2H_6) or digermanium hexahydride gas is colorless, toxic and has a pungent odor. The gas readily burns in air to produce oxides of germanium and hydrogen.

| | |
|------------------------|---|
| Molar mass | 151.228 g/mol |
| Boiling point | 31.5°C |
| Specific volume | 178.03 grams/SCF (=0.393 lb/SCF) |
| Melting point | -109°C |
| Vapor pressure | 10.6 psia at 21°C |
| Critical temperature | 210°C |
| Critical pressure | 671 psia |
| OEL / IDLH | 0.2ppm / 20-30ppm (by analogy to germane gas) |
| Material compatibility | Stainless steels, carbon steel, Kalrez, KelF, PVC, PVDF, PTFE, Viton® |

Registered trademark of DuPont Dow Elastomers.

Shipping Information:

| | |
|---------------|------------------------------------|
| DOT Name | Digermene, Compressed |
| Hazard Class | 2.1, 2.3 |
| ID No. | UN1953 |
| DOT Label | Flammable, toxic inhalation hazard |
| CAS | 13818-89-8 |
| Packing Group | I |
| RTECS | N/A |
| MDL | MFCD00467671 |
| PubChem ID | 24869891 |
| EG/EC | N/A |

Product Information: Metaloids supplies digermene gas as a compressed mixture with hydrogen, deuterium, argon, nitrogen or helium. Carrier gases are at 6N or 99.9999% certified purity unless limited by supply and authorized by end-user. Pure digermene is also available as a dry-ice-subcooled saturated liquid under slight vacuum.

| Digermene min. purity: 99.998% (excl. H ₂ , germane & trigermene) | | Stainless steel valve outlet | Cylinder Sizes | Additional Customer Information |
|---|-------------------------|---------------------------------|----------------|--|
| Hydrogen | < 50 ppm _v | CGA - 350 | 49L Steel | Certificate of analysis provided for each cylinder. Cylinder valve outlets are tapped for optional RFO devices. |
| Nitrogen | < 1 ppm _v | DISS - 632 | 30L Aluminum | |
| Oxygen + Argon | < 0.2 ppm _v | | 44L Steel | |
| Methane | < 0.1 ppm _v | | 30L Aluminum | |
| Carbon dioxide | < 0.1 ppm _v | | 16L Steel | |
| Carbon monoxide | < 0.1 ppm _v | | 16L Aluminum | |
| Germane | < 5000 ppm _v | | 8L Steel | |
| Trigermene | < 200 ppm _v | | 6L Aluminum | |
| Germoxanes | < 2 ppm _v | | 0.44L SS LB | |
| Chlorogermenes | < 2 ppm _v | | | |
| Water | < 1 ppm _v | | | |

Production Plant: Metrocrest Industrial Park, Terrell, TX, USA

Legal Notice: Digermene is a “by-product” (40 CFR 730.3 (d)) in a commercial process and its supply to end-user is restricted by the Toxic Substances Control Act (TOSCA) to research and development purposes (40 CFR 730.3 (cc) and 40 CFR 730.36) under the command of a “technically qualified individual” (40 CFR 730.3 (ee)). The sourcing or acquisition of digermene for “commercial purposes” as defined by 40 CFR 730.3 (r) is strictly disallowed.

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