

Principal Investigator: _____

Date Approved: _____

This document covers basic chemical safety information for silane. The use of silane is subject to pre-approval by the Toxic Substance Committee. DO NOT USE SILANE UNTIL YOU HAVE OBTAINED THE NECESSARY APPROVAL.

Silane

Refer to the University of Arkansas Chemical Hygiene Plan for a description of chemicals that will be considered as a Particularly Hazardous Substance (PHS).

Chemicals that meet the definition of a PHS must be used only in a designated area where limited access, special procedures, knowledge, and work skills are required. A designated area can be the entire laboratory, a specific laboratory workbench, or a laboratory hood. Designated areas must be clearly marked with signs that identify the chemical hazard and include an appropriate warning; for example: WARNING! PARTICULARLY HAZARDOUS SUBSTANCE WORK AREA

Silane is a pyrophoric gas (i.e. it may spontaneously ignite when exposed to air) commonly used in semiconductor fabrication. However, it does not always ignite immediately upon exposure to the atmosphere. Lack of instantaneous ignition can lead to delayed ignition, resulting in fireballs or vapor cloud explosions, which can range in character from deflagration to detonation.



Exposure, Signs and Symptoms and Chemical Properties

Review the appropriate sections of the chemical specific Safety Data Sheet (SDS) for information on ways to detect exposure, appropriate exposure limits, signs and symptoms of exposures and chemical properties. If data is lacking in any area, refer to the following sites for additional information:

<https://pubchem.ncbi.nlm.nih.gov/>

<https://druginfo.nlm.nih.gov/drugportal/>

<https://toxnet.nlm.nih.gov/index.html>

<http://web.doh.state.nj.us/rthksfs/indexfs.aspx>

Always use the smallest amount of chemical that is consistent with the requirements of the work performed. Understand the chemical properties and what are the likely routes of exposure based on those properties and the procedures to be performed. Use containment devices (e.g., fume hood, glove box) when substance can volatilize, when the substance is manipulated, whenever aerosols or particulates may be produced, or when an action may result in an uncontrolled release.

Contact Environmental Health and Safety (EHS) if there are any questions (479-575-5448).

Personal Protective Equipment (PPE) & Personnel Monitoring



Lab Coat



Nomex Suit

Chemical/Flame resistant

Wear a flame resistant lab coat whenever working with silane.
Wear a Nomex suit and hood whenever changing out cylinders.



Gloves

Wear fire gloves when changing out acutely toxic pyrophoric gas cylinders and for any operations where accidental release is a possibility.



Eye Protection



Face Shield

ANSI Z87.1-compliant safety glasses or safety goggles **and** a face shield

Labeling & Storage

Store away from other materials that are chemically incompatible.

Silane must be stored in a gas cabinet or exhausted enclosure away from combustible materials, oxidizing substances, and ignition sources.

Cylinders should be chained to a stable structure such as a wall. The chain should be 1/3 from the top of the cylinder. Alternatively, use a cylindrical casing to secure the cylinder to the floor next to your experimental setup.

Remove regulators from cylinders when not in use and replace with the safety cap. Never use a cylinder without a regulator. Never permit the gas to enter the regulator suddenly. Never try to stop a leak between a cylinder and regulator by tightening the union nut, unless the cylinder valve has been closed first. Never strike an electric arc on the cylinder.

Cautions and Considerations

Use and store only in fully-sprinklered buildings.

Use only spark-proof tools and explosion-proof equipment.

Silane is transported with a vapor-tight cap over the threaded connector, which must be removed in order to connect the regulator. If silane is trapped between the vapor-tight cap and main valve, it may ignite when the cap is removed. Extra care must be taken when removing this cap and fitting a regulator onto a silane cylinder, including the following procedure:

1. Operators should wear all appropriate PPE including fire gloves, Nomex suit or Firefighter turnout, face shield, earplugs, and safety glasses.
2. Operators should have a "buddy" equipped with the same PPE visually observing the operation and ready to assist if necessary.
3. Physically secure the cylinder away from other hazards.
4. Stand to the side of the cylinder valve outlet, then remove the plastic bag and the hold-down wire.
5. Confirm that the valve is closed tightly.

6. Position the cylinder to pull down with a wrench (a box wrench is preferred) when loosening the vapor-tight outlet cap.
 - a. Be aware that flames can come out of the leak-check hole in a Diameter Index Safety System (DISS) vapor-tight outlet cap.
7. Pull down slowly on the vapor-tight outlet cap and anticipate the possibility of a leak. Be ready to push up on the cap to reseal the system if a leak does occur.
 - a. If silane is behind a vapor-tight outlet cap, one of the following will occur: Immediately ignite (a "flamer"), or Not ignite at all, or Ignite after a delay (a "popper")
8. Once the cap has been removed, visually check the valve outlet surface for damage or debris. Never look directly into the outlet. Instead, use a dental mirror for visual inspection.

Silane is capable of forming metastable mixtures with air. In the event that a leak occurs without ignition, DO NOT attempt to close the cylinder. The closing of the valve can trigger an explosion. Instead, evacuate the area immediately and call 911.

Engineering Controls, Equipment & Materials

Fume Hood	Use a fume hood (or equivalent) to keep exposure to materials as low as possible. If your protocol does not permit the handling of such materials in a fume hood, contact EH&S (479-575-5448) to perform an exposure assessment to determine whether alternative engineering controls or additional respiratory protection is required.
Burn Box	Consult with EH&S to determine if a burn box is necessary for your operations.

Housekeeping

Spills	Notify others in the area of the spill, including your supervisor. Evacuate the location where the spill occurred. Call 911 and report any exposure to EHS (479-575-5448). Remain on-site (at a safe distance) to provide detailed information to first responders.
Decontamination	After each use (or day), wipe down the immediate work area and equipment to prevent accumulation of chemical residue. Decontaminate workspace with appropriate materials (refer to the SDS). When finished wash hands and arms with soap and water and properly dispose of all wastes. Contaminated items (e.g., solid and liquid materials and PPE) should be discarded as hazardous waste.
Waste	Refer to the UA Chemical Hygiene Plan for details and contact EHS (479-575-5448) for specific disposal instructions.

First Aid & Emergencies

Skin or Eye Contact	Remove contaminated clothing and accessories; flush affected area for at least 15 minutes with water. If symptoms persist, get medical attention/call 911.
Inhalation	Move person into fresh air. If symptoms persist, get medical attention/call 911.
Ingestion	Rinse mouth with water. If symptoms persist, get medical attention/call 911.

Authorized and Trained Personal

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