

# silicon dioxide (diatomaceous earth)

Review Date: 06/28/2011

CAS #: 7631-86-9

Type	Insecticide - dust formulated products that contain at least 80% active ingredient (or combined with other active ingredients).
Controls	Spiders and other insects.
Mode of Action	Dries out insects by removing the oily protective film covering their bodies which normally prevents the loss of water.

## Thurston County Review Summary:

Silicon dioxide is rated low in hazard by Thurston County and passes the review criteria.

Silicon dioxide (diatomaceous earth) is made up of approximately 90% silica, the same as is in quartz, sand and agate. The type of silica found in diatomaceous earth is predominately amorphous silica but will contain small amounts of crystalline silica (which is associated with severe lung toxicity). Crystalline silica is classified as a known human carcinogen but amorphous silica is not classifiable as to human carcinogenicity. According to product registration staff at the Washington State Department of Agriculture, all products registered in Washington with silicon dioxide as the active ingredient contain amorphous silica (Reference 4). The EPA includes crystalline-free silica in the list of minimal risk inert ingredients and the FDA allows it to be added to food at rates up to 2% by weight.

## MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	120	2	Low
Soil Sorption (Kd=mL/g)			
Organic Sorption (Koc=mL/g)			

### Mobility Summary:

The EPA waived all environmental fate data requirements for silicon dioxide because it is naturally occurring and very prevalent in our environment. The hazard for mobility is rated low for silicon dioxide.

## PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	1350000	2	Low
Biotic or Aerobic Half-life (days)	Stable	2	High
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	Not found		
Hydrolysis Half-life (days)	Stable	2	High
Anaerobic Half-life (days)	Stable	2	High
Aquatic Field Test Half-life (days)	Stable	2	High

### Persistence Summary:

Silicon dioxide is not expected to react with any naturally occurring chemicals and is considered stable under environmental conditions. Silicon dioxide is considered high in hazard for persistence.

## BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	Not found		

### Bioaccumulation Summary:

Material Safety Data Sheet information states that there is "no potential for bioaccumulation" from amorphous silicon dioxide (Reference 6). No other bioaccumulation data could be located. The hazard for bioaccumulation is rated low.

# ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	5,110 mg/kg	2	Low
Avian (LD50)	Not found		
Honey bee or insect (LD50)	Not found		
Annelida -worms (LC50)	Not found		
Fish (LC50)	10,000 mg/L	2	Low
Crustacean (LC50)	1,000 mg/L	2	Low
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

## Acute Toxicity Testing and Ecotoxicity Summary:

EPA waived 40 CFR Part 158 requirements for silicon dioxide registration, including potential ecological effects from pesticidal use of silicon dioxide. Silicon dioxide is abundant in nature and pesticidal use of silicon dioxide is not expected to produce toxicity to non-target organisms.

# ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Short-term risk assessment wasn't required by EPA						
Short-term risk assessment wasn't required by EPA						
Short-term risk assessment wasn't required by EPA						
Short-term risk assessment wasn't required by EPA						

## Acute Toxicity Risk Assessment Summary:

Ingestion of various forms of silicon dioxide occurs naturally in many food items and the Food and Drug Administration has allowed silicon dioxide to be used as a food additive up to 2% by weight.

The EPA believes potential inhalation and dermal exposure for the applicator of silicon dioxide insecticides may be significant (but infrequent). The European Union stated that silicon dioxide dust can cause silicosis and bronchitis, although amorphous silica has not been associated with silicosis (References 1 and 3). Although amorphous silica is not linked to silicosis, it can still cause harm to lungs if inhaled in large quantities. To mitigate the hazards associated with inhalation exposures, products which are used commercially, containing silicon dioxide as the sole active ingredient, require the following statement: "Wear a suitable dust mask approved by NIOSH/MSHA." Silicon dioxide product labels also caution all applicators to avoid contact with eyes and skin, avoid breathing dust, and to use a dust mask during prolonged periods of use.

There are serious adverse health effects associated with silicon dioxide dust that can be incurred with significant inhalation exposures. Inhalation exposures of that magnitude would not likely be caused from labelled uses of silicon dioxide insecticides (except, perhaps, from occupational uses). The recommended use of respirators by commercial applicators would greatly reduce these inhalation exposures.

The risk of toxicity from labelled uses of silicon dioxide insecticide products is rated low.

# CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	IARC Group 3	Not classifiable	3	Low
Mutagenicity	Not found			
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not listed	--	5 and 7	Low
Developmental Toxicity (NOAEL)	Not found			
Reproductive Toxicity (NOAEL)	Not found			
Chronic Toxicity (NOAEL)	Not found			

## Chronic Toxicity Hazard Summary:

EPA waived 40 CFR Part 158 requirements for toxicology data for silicon dioxide pesticide registration. Silica dust (amorphous) is classified by the International Agency for Research on Cancer in Group 3 (not classifiable as to its carcinogenicity to humans). Material Safety Data Sheet information states that silicon dioxide is not known to cause toxicity to the reproductive system or have adverse effects on fertility (Reference 6).

# CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Long-term exposures were not evaluated						
Long-term exposures were not evaluated						
Long-term exposures were not evaluated						
Long-term exposures were not evaluated						

## Chronic Toxicity Risk Assessment Summary:

The EPA believes that expected uses of silicon dioxide insecticide products would result in exposures that are short in duration and not chronic (ongoing throughout a lifetime). Long-term risk assessments were not evaluated.

## Metabolites and Degradation Products:

None expected.

## Comments:

Silicon dioxide is considered a moderate eye irritant and a mild skin irritant. It also may cause sensitization with prolonged contact with skin or through inhalation of dust (Reference 2).

## References

- USEPA. Office of Prevention, Pesticides, and Toxic Substances. Reregistration Eligibility Document. Silicon Dioxide and Silica Gel - LIST D. Case 4081. September 1991.
- International Union of Pure & Applied Chemistry. Pesticide Properties Database. Silica. Accessed 6/28/11. <http://sitem.herts.ac.uk/aeru/iupac/>
- International Agency for Research on Cancer. Agents Classified by the IARC Monographs, Volumes 1-102. (Accessed 6/28/2011). <http://monographs.iarc.fr>
- Shannon Lumsden. Washington State Department of Agriculture. Personal communication on 6/30/2011.
- Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 6/30/2011). <http://www.scorecard.org/health-effects>.
- Rentokil Initial Supplies. Material Safety Data Sheet. Cockroach Powder - HSE 9246. 10 : 03 : 2011.
- Illinois EPA. "Endocrine Disruptors Strategy". February, 1997.
- USEPA. Office of Prevention, Pesticides and Toxic Substances. Inert Ingredients Eligible for FIFRA 25(b) Pesticide Products. Last Updated December 20, 2010