Crystalline Silica Background Information

LIFE Seeds, Inc.
1900 Chelsea Road
Baltimore, Maryland 20852
410-467-4771

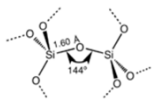
Galson SGS Laboratories
6601 Kirkville Road
East Syracuse, NY 13057
888-432-LABS (5227)

Silica Uses and Health Effects

What Is Silica?

- SiO_2 – Silicon Dioxide

Element	Symbol	% of Atoms	% of Mass
Oxygen	O	46.99%	31.02%
Silicon	Si	27.95%	32.29%
Aluminum	Al	8.20%	9.13%
Iron	Fe	5.04%	11.65%
Calcium	Ca	3.66%	6.04%
Sodium	Na	2.85%	2.71%
Potassium	K	2.61%	4.20%
Magnesium	Mg	2.11%	2.09%
Titanium	Ti	0.44%	0.88%
Hydrogen	H	0.14%	0.01%

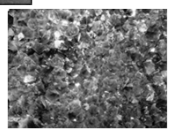


Quartz

- Granite, sandstone, and other rocks.
- Most sand.
- Many colors and beautiful crystals can form.







Quartz

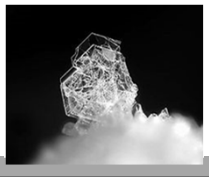
- Uses (short list)
  - Pre-historic arrowheads
  - Fire starting
  - Glass (becomes not crystalline in process)
  - Piezo-electric crystals in electronics
  - In construction
    - Class Participation

Tridymite and Cristobalite

Produced at high pressures. Rare in crust.

Tridymite – Rare. Can be manufactured. Used as linings in blast furnaces, open-hearth furnaces, and hot stoves utilized in smelting to create industrial metals.

Cristobalite – Rare. No uses reported.

Health Effects

- Silicosis – Fibrosis of lungs. Shortness of breath, cough. May allow lung infections, in particular TB.
  - Chronic >10 years of low level exposure
  - Accelerated <10 years of elevated exposure
  - Acute <2 years of very high exposure – Often fatal
- COPD
  - Heart disease may be subsequent to COPD. Associated with silica exposure.
- Kidney Disease
- Autoimmune Disease

Silicosis

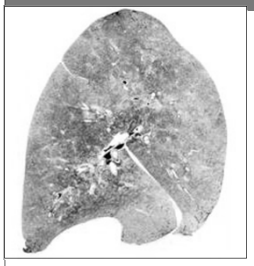
- Silicosis affects the lungs by damaging the lining of the lung air sacs. Once this begins, it leads to scarring and, in some situations, to a condition called progressive massive fibrosis. This condition happens when there is severe scarring and stiffening of the lung, which makes it difficult to breathe.

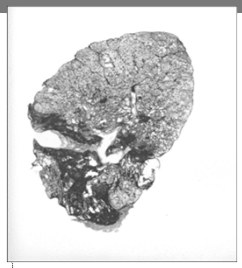
Symptoms of Silicosis

- Cough
- Weight loss
- Tiredness
- Wheezing
- Fever or a sharp chest pain
- Shortness of breath over time, especially with chronic silicosis.
- Having silicosis increases the risk of other problems, such as kidney disease, tuberculosis, lung cancer, and chronic bronchitis

Effect On The Lung

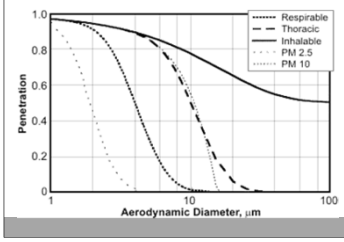
Normal Lung **Lung With Silicosis**





Route Of Entry

- The **respirable dust fraction** - small particles that penetrate to the alveoli.



HEPA Filter mechanisms

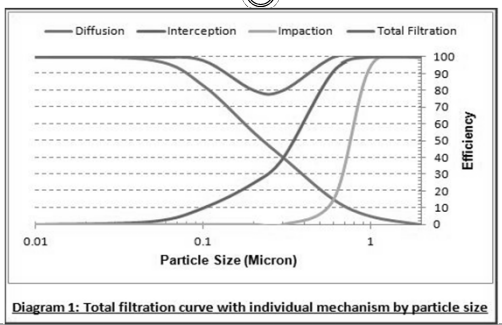
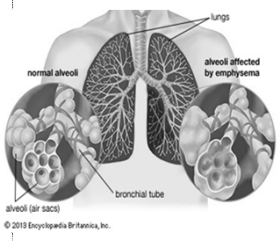


Diagram 1: Total filtration curve with individual mechanism by particle size

Respirable Size Fraction

- <10 microns, 50% of particles < 4 microns
- Small enough to reach alveolar region of the lung. This is deepest part of the lung where gas exchange occurs.
- >10 micron particles removed by impaction.
- 5 to 10 micron particles removed by sedimentation
- <0.5 micron particles removed by Brownian motion.



Diagnosis

- Physical exam – primary focus on heart and lungs
- Chest X-Ray
- Pulmonary function test