

Comments Concerning Crystalline Silica Monitoring Analytical Results Obtained from Air Sampling at the CDF Station, 2391 Willow Road, Arroyo Grande, California, in April/May/June of 2017

BY: John W. Kelse , Industrial Hygienist

Date: December 14, 2017

At the request of the California Department of Parks and Recreation (DPR), I have reviewed airborne crystalline silica sampling results obtained from air filter samples collected at 2391 Willow Road, Arroyo Grande, California. This address is the location of an air quality monitoring station, known as the CDF Station, managed by the San Luis Obispo County Air Pollution Control District (SLOAPCD). The CDF location is approximately 2.5 miles from the ocean shoreline and about one mile from the eastern boundary of the Oceano Dunes State Vehicular Recreation Area (SVRA), a state park managed by the DPR. The reviewed analytical reports, from Forensic Analytical Laboratories of Hayward, California, are attached to this document.

It is presumed the samples were collected and analyzed as part of an environmental monitoring program undertaken by the SLOAPCD. According to data presented on the analytical reports, a total of four air filter samples were collected and analyzed. The samples were collected on April 25 and 27, 2017, May 12, 2017, and June 12, 2017. Samples were analyzed using National Institute for Occupational Safety and Health (NIOSH) Method 7603 (with infrared, or IR, analysis) and NIOSH Method 500/600 Modified. It is assumed, since the methods employed require respirable fraction analysis, that the crystalline silica (quartz) sample content represents respirable crystalline silica (particulate that is 10 microns or smaller in aerodynamic size) with collection times spanning 6 to 8 hours.

Analytical Method: With respect to the analytical method applied, it is my understanding that IR analysis is a reliable analytical methodology (originally developed for detecting crystalline silica in coal dust) with reasonable inter-laboratory consistency when the principle interference (amorphous silica) is predictably removed or minimized. An alternative analysis, NIOSH Method 7500 (using x-ray diffraction or XRD), however, is a more widely applied analytical approach in occupational-crystalline-silica-exposure settings as it is less subject to silica polymorph interferences as a result of the phosphoric acid treatment applied with this method. Good inter-laboratory agreement exists with this method as well. In general, I am aware that XRD analysis (using NIOSH Method 7500) has become the most preferred analytical approach over the last 10 years or so and the one most applied when comparing to crystalline silica airborne exposure to workplace exposure limit standards.

Results: The analytical results show that crystalline silica concentrations, if present at all, generally fall at or below the detection limit of the analytical method used (Three of the four sample results reported at the 10 microgram detection limit of the analysis; one sample reported at 20 micrograms). More recent XRD analysis per NIOSH Method 7500 of air filter samples collected within the sand dunes of Oceano Dunes SVRA has shown similar below-detection limit-crystalline silica (quartz polymorph) results. Such consistent trace- or zero-detected levels strongly suggest the absence of a warranted crystalline silica risk in the coastal setting where the samples were collected.

It has been pointed out that while beach sand typically contains crystalline silica, the particle size is 100 or more times greater than the respirable size that is linked to human risk

(https://www.osha.gov/silica/Silica_FAQs_2016-3-22.pdf;
<https://www.cdc.gov/niosh/pdfs/silicax.pdf>).

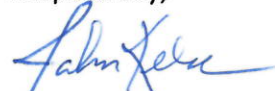
In my own professional experience, where for more than 50 years I have sampled for airborne crystalline silica particles in industrial settings, I've often been surprised at how little respirable quartz is recorded in mineral dust environments with high crystalline silica content (some upwards of 50%). I find this linked to how much energy it apparently takes to produce very fine quartz particulate.

In the reviewed analytical results, it's interesting that crystalline silica polymorphs (quartz, cristobalite and tridymite) are addressed separately. Generally, quartz is by far the most common form of crystalline silica encountered. I have rarely encountered cristobalite (typically linked to volcanic deposits in origin) and never tridymite. Nonetheless, it is beneficial to examine this breakdown, particularly in a new setting, so it is appreciated that the analysis has been performed. In the crystalline silica analytical method most commonly used (NIOSH Method 7500), the total silica content is reported, which includes polymorph content.

Standards: When reporting crystalline silica airborne particulate levels it is of obvious interest to compare these levels to some standard for "meaning." The current United States Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for respirable crystalline silica dust is 50 micrograms per cubic meter of air (0.05 milligrams per cubic meter of air) over an 8 hour workday, 5 days per week for 40 years. Some health researchers feel this limit is overly restrictive and argue that there is no evidence that compliance to the previous OSHA PEL (100 micrograms per cubic meter of air) was inadequately protective. These arguments are laid out in the OSHA rulemaking record (<https://www.federalregister.gov/documents/2016/03/25/2016-04800/occupational-exposure-to-respirable-crystalline-silica>).

Conclusion: Whether one puts faith in the reliability of the current occupational health standard for crystalline silica or not, my review of the presented analytical results render these questions essentially mute in my opinion. The analytical reports of the air filter samples collected at the CDF air monitoring station in April, May, and June 2017 offer no evidence of a realistic pulmonary (inhalation) risk with respect to crystalline silica.

Respectfully,



John Kelse

Attachments: Forensic Analytical Laboratories, Final Report to County Air Pollution Control District Project Manager, Report Number M184679, May 17, 2017.

Forensic Analytical Laboratories, Final Report to County Air Pollution Control Dist., Report Number M184678, June 30, 2017.

Crystalline Silica in Air with Gravimetry by Fourier Transform Infrared (FTIR) Spectroscopy

NIOSH Method 7603 / NIOSH Method 500/600 Modified

County Air Pollution Control Dist.
Project Manager
San Luis Obispo
3433 Roberto Ct.
San Luis Obispo, CA 93401

Client ID: 7240
Report Number: M184679
Date Received: 05/11/17
Date Analyzed: 05/17/17
Date Printed: 05/17/17
First Reported: 05/17/17

Job ID / Site: PO #51208 - CDF, 2391 Willow Rd, Arroyo Grande, CA
Date(s) Collected: 4/25/17 & 4/27/17

FALI Job ID: 7240
Total Samples Submitted: 2
Total Samples Analyzed: 2

Sample Number	Lab Number	Volume	Analyte	Result	Result Units	Reporting Limit*
PO111	30767521	990 L	Quartz	0.020	mg/m3	0.010
			Cristobalite	< 0.010	mg/m3	0.010
			Tridymite	< 0.010	mg/m3	0.010
			Total Silica	0.02	mg/m3	0.010
			Dust	< 0.2	mg/m3	0.2
PO108	30767522	990 L	Quartz	0.010	mg/m3	0.010
			Cristobalite	< 0.010	mg/m3	0.010
			Tridymite	< 0.010	mg/m3	0.010
			Total Silica	0.01	mg/m3	0.010
			Dust	< 0.2	mg/m3	0.2

* The reporting limit represents the lowest amount of analyte that the laboratory can confidently detect in the sample, and is not a regulatory level. The units for the reporting limit are the same as the units for the final results.



Lawrence E. Wayne, Applied Microscopy Supervisor, Hayward Laboratory

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Crystalline Silica in Air with Gravimetry

by Fourier Transform Infrared (FTIR) Spectroscopy

NIOSH Method 7603 / NIOSH Method 500/600 Modified

County Air Pollution Control Dist.
Karl Tupper
San Luis Obispo
3433 Roberto Ct.
San Luis Obispo, CA 93401

Client ID: 7240
Report Number: M186478
Date Received: 06/23/17
Date Analyzed: 06/30/17
Date Printed: 06/30/17
First Reported: 06/30/17

Job ID / Site: PO #51208, CDF, 2391 Willow Rd., Arroyo Grande
Date(s) Collected: 05/12/17 & 06/12/17

FALI Job ID: 7240
Total Samples Submitted: 2
Total Samples Analyzed: 2

Sample Number	Lab Number	Volume	Analyte	Result	Result Units	Reporting Limit*
PO109	30771942	1,224 L	Quartz	< 0.008	mg/m3	0.008
			Cristobalite	< 0.008	mg/m3	0.008
			Tridymite	< 0.008	mg/m3	0.008
			Total Silica	< 0.008	mg/m3	0.008
			Dust	< 0.05	mg/m3	0.05
PO129	30771943	1,004 L	Quartz	0.010	mg/m3	0.010
			Cristobalite	< 0.010	mg/m3	0.010
			Tridymite	< 0.010	mg/m3	0.010
			Total Silica	0.01	mg/m3	0.010
			Dust	< 0.05	mg/m3	0.05

* The reporting limit represents the lowest amount of analyte that the laboratory can confidently detect in the sample, and is not a regulatory level. The units for the reporting limit are the same as the units for the final results.



Lawrence E. Wayne, Applied Microscopy Supervisor, Hayward Laboratory

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