Sampling & Analysis of crystalline silica
Determining Where, What, How Many & How Cont’d

How Many:
- Personal sampling – usually 1 sample + a blank per person (typically 8 hr shifts).
- Ambient air sampling – 2 samples + blank per location

How:
- ID similar exposure groups in your facility or construction site & determine possible exposures
  - (i.e. welders (welding fume profile), concrete cutters (silica & dust, etc). Call SGS Galson Client Services to order your equipment & media

Collect samples & ship back to lab for analysis
- If there is an over exposure identified in the report, call in expert/consultant to help mitigate and engineer solution (we can refer great companies)
- Reference our online Instructional Videos to learn how to properly collect samples
- Any questions contact Client Services: 888-432-5227
Control → Recognize → Evaluate
Particle deposition in respiratory tract
Respirable dust sampling

- Taken using a “Cyclone” Sampler

Nylon Dorr-Oliver  GK 2.69  SKC  Higgins-Dewell
Respirable dust sampling

• Flow Rate Determines Cut-Point Collected

<table>
<thead>
<tr>
<th>Type of Cyclone</th>
<th>Flow Rate (L/min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mm Dorr-Oliver nylon cyclone</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>(3.5 um cut point)</td>
</tr>
<tr>
<td>SKC aluminum cyclone</td>
<td>2.5</td>
</tr>
<tr>
<td>Higgins-Dewell cyclone</td>
<td>2.2</td>
</tr>
<tr>
<td>GK 2.69 cyclone</td>
<td>4.2</td>
</tr>
</tbody>
</table>

(calibrate both pre and post sampling; need to be within 5% of required flow)
Silica sampling

• Perform Pre Sampling Calibration Check for Proper Flow Rate (2 LPM), Record Flow Rate
• Sample Full-Shift Whenever Possible
• Record Activities, Start and Stop Times
• Periodically Check on Employees; Record Observations
• Perform Post Sampling Calibration Check, Record Flow Rate
• Include Field Blanks

FIELD NOTES GIVE CONTEXT TO LAB DATA!
Respirable dust sampling

• Don’t Turn the Cyclone upside Down Until you’ve removed the filter!
  • Grit from pot could enter the cassette.

• Clean Cyclones Between Use
  • Use mild soap and water
  • Ultrasonic cleaner
  • Be careful not to scratch cyclone interior
Respirable dust sampling

• Alternative to Cyclone – SKC Parallel Particle Impactors (PPI) Sampler
  • Meets Standard Requirements
  • Single use or Re-Usable
  • 2, 4, or 8 LPM Models

• Pros:
  • Removes some problems associated with cyclones
  • Availability of High-Flow Personal Sampling Pumps

• Cons:
  • Single use adds cost
Respirable Dust Sampling
Key components: labs

- The proposal mandates that companies have silica samples analyzed by laboratories that meet specified accreditation criteria:
  - Accredited to ISO 17025
  - Evaluates all samples using the procedures specified in one of the following analytical methods: OSHA ID-142; NMAM 7500; NMAM 7602; NMAM 7603; MSHA P-2; or MSHA P-3
  - X-Ray Diffraction or Infrared Spectroscopy (Most labs use XRD – MSHA uses IR)
  - Must be able to identify polymorphs and account for interferences
  - 5 point calibration Curve
  - NIST Traceable Standards
  - LOD Optimized to be no higher than 25% of PEL based on air volume
  - Labs have till June 23, 2018 to comply

ASK TO SEE YOUR LAB’S PT DATA!!
Crystalline Silica Analysis

• Gravimetric – NIOSH 0600
  • Filters conditioned at Standard Temperature and Humidity (20 °C ± 1 °C and 50% ± 5% RH)
  • Samples Taken on Filter using a cyclone
  • Filters Re-conditioned for at least 2 Hours
  • Weighed on Microbalance
  • Detection Limit is 50 micrograms (ug)
CRYSTALLINE SILICA ANALYSIS

• Measures the three angles occurring from the x-rays bouncing off of the crystalline silica

• Amorphous silica not measured as there is no crystalline structure
Report Format

<table>
<thead>
<tr>
<th>Sample_ID</th>
<th>Lab_ID</th>
<th>Analyte</th>
<th>Air Vol</th>
<th>ug</th>
<th>ug/m³</th>
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</thead>
<tbody>
<tr>
<td>V</td>
<td>QCT</td>
<td>Quartz</td>
<td>1200</td>
<td>14</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>L376941-1</td>
<td>Cristobalite</td>
<td>1200</td>
<td>&lt;5.0</td>
<td>NA</td>
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<tr>
<td></td>
<td></td>
<td>Tridymite</td>
<td>1200</td>
<td>&lt;20</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total silica</td>
<td>1200</td>
<td>14</td>
<td>12</td>
</tr>
</tbody>
</table>

- All three forms listed
- Use Total Silica Result to Compare to Standard
CONTACT INFORMATION:

THANK YOU! QUESTIONS?

Bill Walsh, CIH
Environment, Health and Safety
Global/National Team

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