WHITE PAPER

Is a White Deposit Amorphous or Crystalline Silica?

Density, XRD, and XRF on a deposit from a vessel burning siloxane-containing gas

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Key finding

The three measurements pointed to roughly 90% amorphous silica, with crystalline silica at an estimated 2 to 6% of the deposit. The crystalline figure is an estimate and needs accredited confirmation for any exposure decision.

The question

A facility sent a white deposit from a combustion vessel that burns a waste gas containing siloxanes. Silica was the expected residue. The open question was whether it was amorphous silica, which falls outside the respirable crystalline silica standard, or quartz and cristobalite, which fall inside it.

Three measurements

Helium pycnometry gave a density of 2.25 g/cm^3, well below quartz at 2.65, so most of the material was glass-like. XRD showed a broad hump near 22° 2θ with only a few weak sharp peaks on top. XRF put silicon at about 96% as SiO_2, and the density calculated from that composition landed within 0.1% of the measured value.

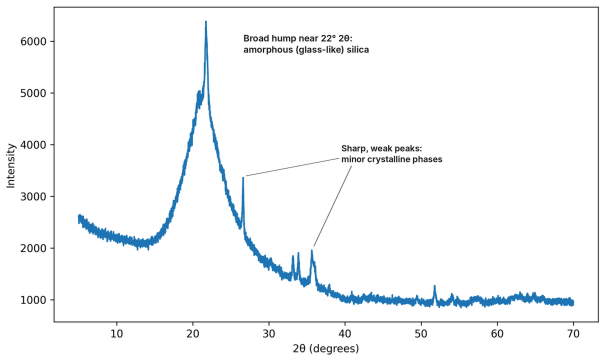


Figure 1. *XRD pattern with the amorphous hump and the sharp crystalline peaks labeled.*



Figure 2. *The powder as received.*

What the data indicate

Together the data pointed to roughly 90% amorphous silica, with crystalline silica at an estimated 2 to 6% of the deposit. The rest was iron oxides, an iron silicate, and tin oxide. Iron with chromium and nickel, and tin with antimony, are patterns typical of stainless steel and bearing-metal wear, so the deposit also gave an early hint about nearby rotating equipment.

Limits of this result

The crystalline number is an estimate. Standard Rietveld refinement cannot quantify an amorphous phase without a spiked internal standard, and I recommended that follow-up. For any exposure decision, confirm the results at an accredited lab (NIOSH 7500 or OSHA ID-142) alongside air monitoring. A first look like this shows whether the accredited analysis is worth ordering.

About this work

Cubic Labs LLC analyzes materials by powder XRD, XRF, and SEM-EDX at Purdue University and helium pycnometry in its own lab. Client details are withheld. If you manage a plant, an EHS program, or a maintenance budget and have a deposit, scale, or dust nobody can identify, send a photo and a short description to info@cubiclabsllc.com or (701) 330-1911. Results stay confidential to you.