

Quantitative Determination of Respirable Quartz on Silver Membrane Filters

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Introduction

The quantitative determination of respirable quartz deposited on silver membrane filters is a standard procedure for the mining industry and government institutions. These measurements are made to monitor the venting in mines to decrease the risk of Silicosis. Silicosis is a disabling, nonreversible and sometimes fatal lung disease, caused by overexposure to respirable crystalline silica. There is no cure for the disease, but it is 100% preventable if employers, workers, and health professionals work together in reducing exposure. XRD quantification helps to determine and control the exposure by accurately measuring the deposited amount on a filter.

Following NIOSH procedure 7500, the respirable silica is sampled using a Cyclone and

filter onto a 5 μ m PVC membrane. Then, after ashing and isolation in tetrahydrofuran, redeposited on a 0.45 μ m Ag membrane filter.

Calibration samples are obtained by carefully depositing NIST SRM 1878, 1879, and 2679 sample material with the same redepositing procedure onto the Ag filters following NIOSH procedure 7500.

The safety of the exposed workers require a very high degree of accuracy as well as a low detection limit for this type of analysis. Using the powerful DQUANT, which is part of the DIFFRAC^{plus} package, and standards deposited by CANMET, a calibration curve was measured using a Bruker D8 ADVANCE in the following configuration

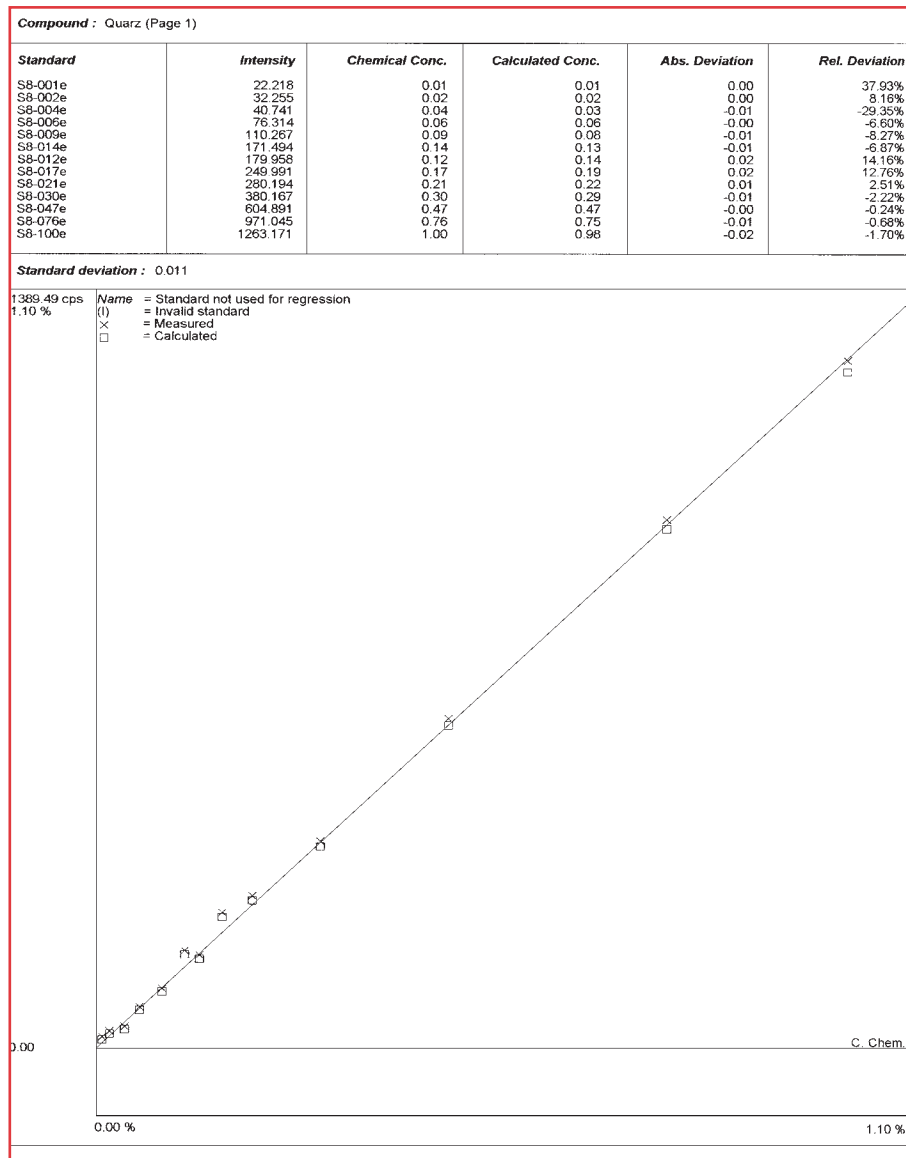
System Configuration

D8 ADVANCE $\theta/2\theta$ X-ray Powder Diffractometer

Source	Co long fine focus X-ray tube
Diffracted Beam Optics	Fixed divergence 2mm slit Fixed antiscatter 2mm slit
Detector Slit	0.2mm
Detector	Dynamic Scintillation Detector
Measuring Time	For 3 Quartz peaks and 1 Silver peak: 30 min.

The following example shows a calibration curve for the qz 100 reflection using integral intensities and automatic displacement correction. (one of the 6 intensity models that DQUANT offers,

Internal ratios are also possible). The Lower Limit of detection was calculated to be 0.01 mg SiO₂.



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