

Are you interested in occupational health? Would you like to perform a Bachelor, Semester or Master thesis at the Swiss accident insurance institute (Suva) and help develop the analytical method for the specific analysis of quartz?

Did you ever ask yourself if and why an insurance company such as Suva has an analytical laboratory?

The Suva's analytical laboratory is the competence center of Switzerland for field sampling and analysis of chemical and biological pollutants. Our most important tasks include:

- Carrying out pollutant measurements in plants (sampling on site, analysis of air samples in the laboratory, preparation of a detailed measurement report): The orders come mainly from the field service of Suva within the framework of the sovereign supervisory duty of Suva in the field of occupational disease prevention (UVG).
- Analyses of material samples (and air samples from third parties): Samples are usually collected by the clients (internal and external) themselves and sent to our laboratory. Among the most common assignments are clarifications regarding asbestos.
- Introduction/development/optimization of measurement methods: The measurement and analysis methods must be continuously adapted to the current conditions. For example, new methods must be introduced when new substances are added to the list of limit values, or improved when limit values are lowered.
- Execution of experimental presentations: Together with ALC and SRC, experimental lectures are held, in which particularly fire and explosion hazards are demonstrated.

Why is quartz in occupational health important and how do we determine the quartz concentration?

Quartz dust is a carcinogenic substance. Where employees are exposed to high levels of quartz-containing fine dust, there is a risk of severe lung diseases (pneumoconiosis): Silicosis with lung cancer, pulmonary tuberculosis, or bronchitis. Quartz dust can occur in various industries - wherever materials containing quartz are processed (e.g., gravel and concrete plants, underground construction, building construction, etc.). Therefore, the analysis of quartz has been an important issue for Suva since its foundation in 1918.

The samples almost always come in the form of dust-loaded filters (which originate from sampling at various places of different companies). The determination of the quartz concentration on the dust-loaded filters is based on XRD. XRD offers the identification of quartz in diverse matrices. In the laboratory the dust-loaded filters from the field are being transferred to silver-filters. This transfer not only reduced the baseline for the analysis by XRD but also allows to dilute the sample and reduce matrix effects.

The calibration of the quartz concentration on the dust-loaded filter is based on a linear function between the quartz mass and the XRD signal intensity. As the XRD-signal is dependent on the crystal size, the crystal size of the sample and the calibration standard need to match. Therefore, the calibration material in quartz analysis with XRD is very crucial and part of ongoing research.

What will be your task?

Your task will be to perform a method validation of the quartz analysis with a new XRD System (Empyrean from Malvern Panalytical GmbH, Kassel, Germany). This includes various tests such as:

- Investigation of matrix influences – how do different minerals such as calcite or dolomite influence the XRD-signal?
- Comparison of different calibration strategies – what is the influence of different calibration standards?
- Determination of the detection limit - What is the detection limit of the new system?
- Evaluation of a possible peak deconvolution – can peak-overlaps be overcome by peak deconvolution?

You will also be invited to join us on a field sampling trip – to see a typical industry where quartz occurs and how we perform field sampling.

What is the timeframe?

We are flexible - you can start as soon as September 2023.

Who should you contact?

I am looking forwards to hearing from you:
Dr. Debora Käser
Department of analytics - Team leader dust and gas
Rösslimattstrasse 39, 6005 Lucerne
debora.kaeser@suva.ch
041 419 6739

In collaboration with:
Prof. Dr. Detlef Günther
Spurenelement- und Mikroanalytik
Vladimir-Prelog-Weg 1, 8093 Zürich
guenther@inorg.chem.ethz.ch
044 632 46 87