

# XRD and Rietveld Refinement

are we missing out by focusing on one  
component?

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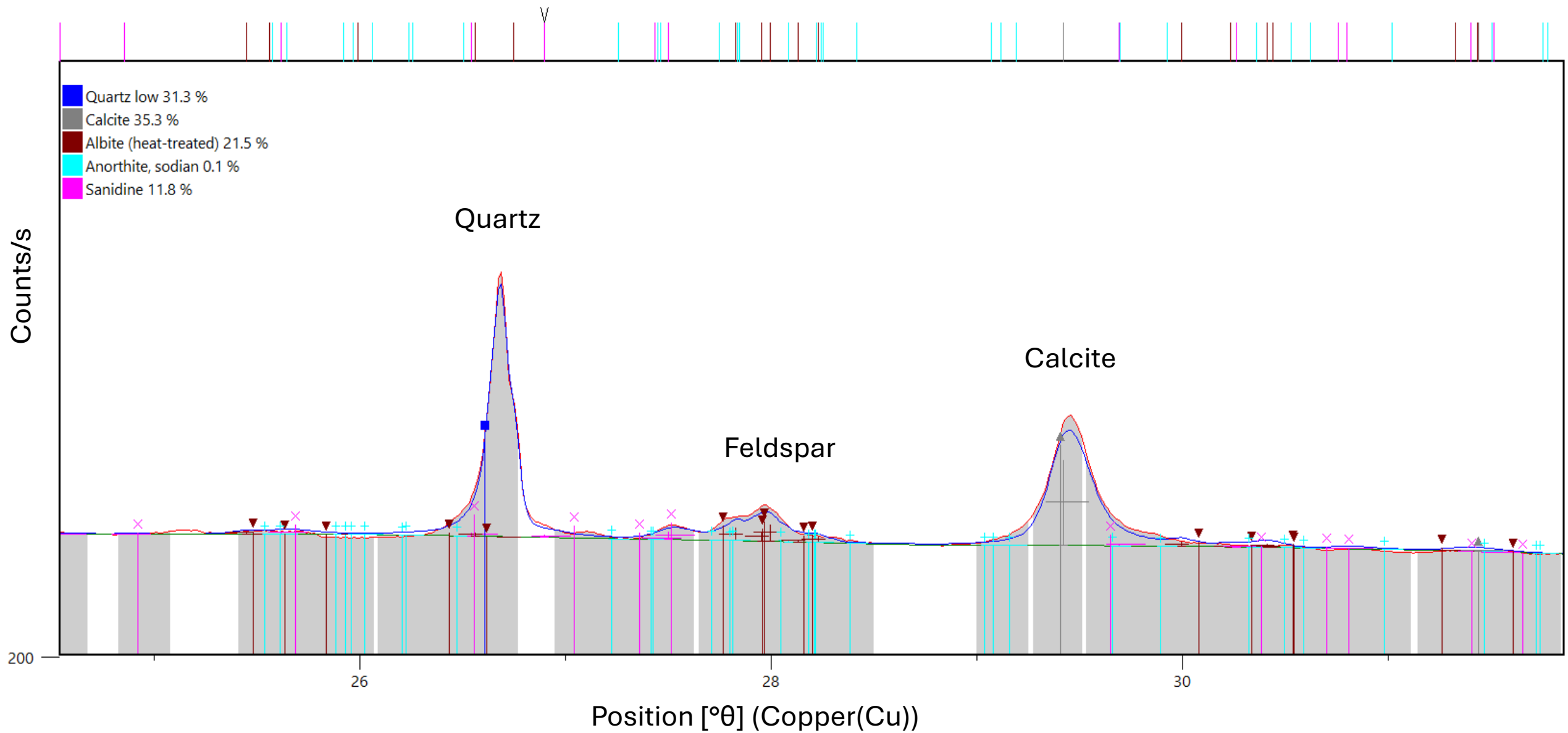
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# Background

- Exposure to crystalline components in **respirable dust** has adverse health effects
  - e.g. quartz is a carcinogen and may cause silicosis
- Quartz and other minerals in building materials
- Generation of dust through mechanical work
- Rietveld Refinement have been used to determine content of inhalable dust in a laboratory setting, but not respirable dust
- Can Rietveld Refinement be used on respirable dust to obtain more information?

## NIOSH Method 7500

- / From The National Institute for Occupational Safety and Health
- / X-ray diffraction analysis (XRD)
- / Specific for respirable crystalline silica (RCS)
- / Specific sample preparation/ treatment
- / Uses an external standard for quantification

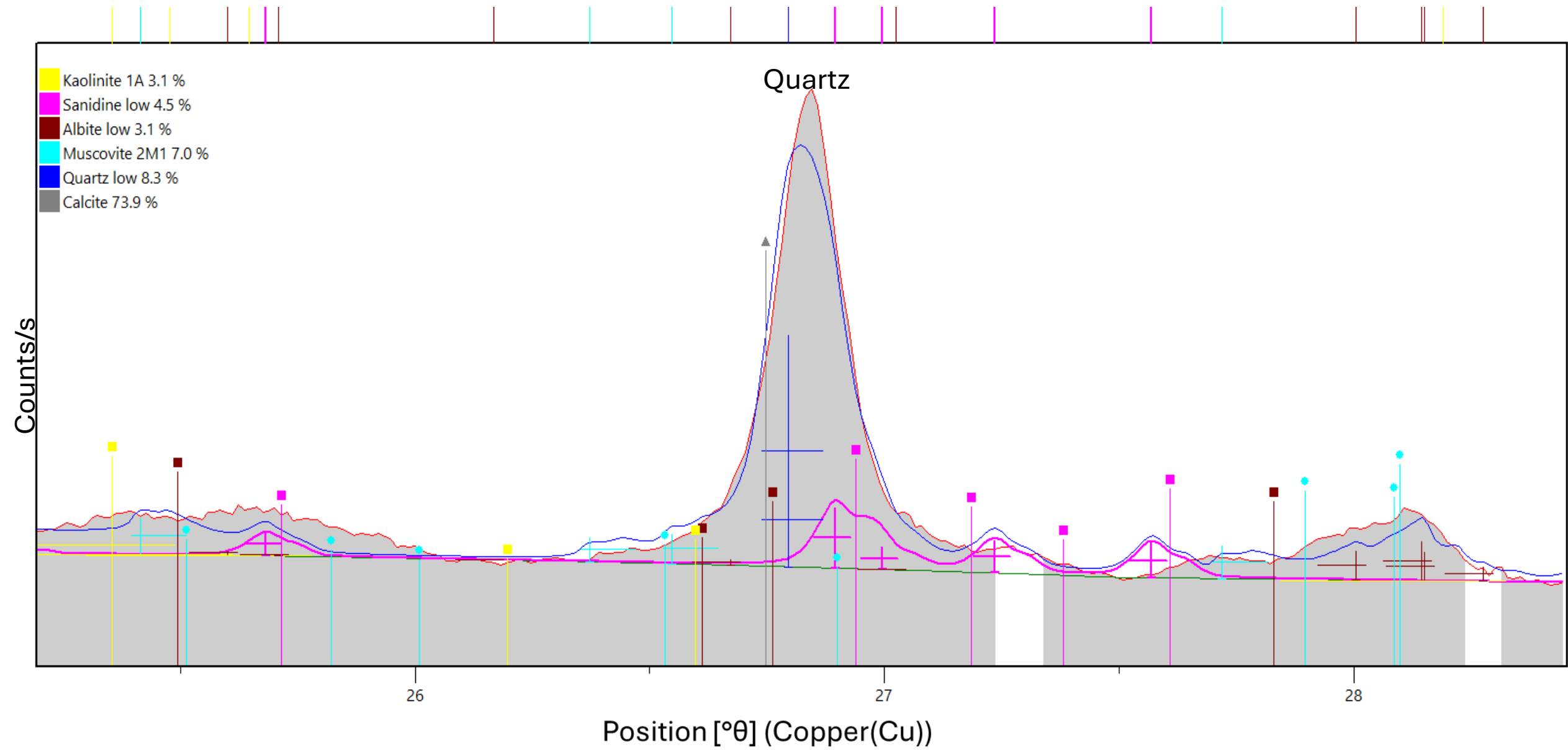


## NIOSH Method 7500

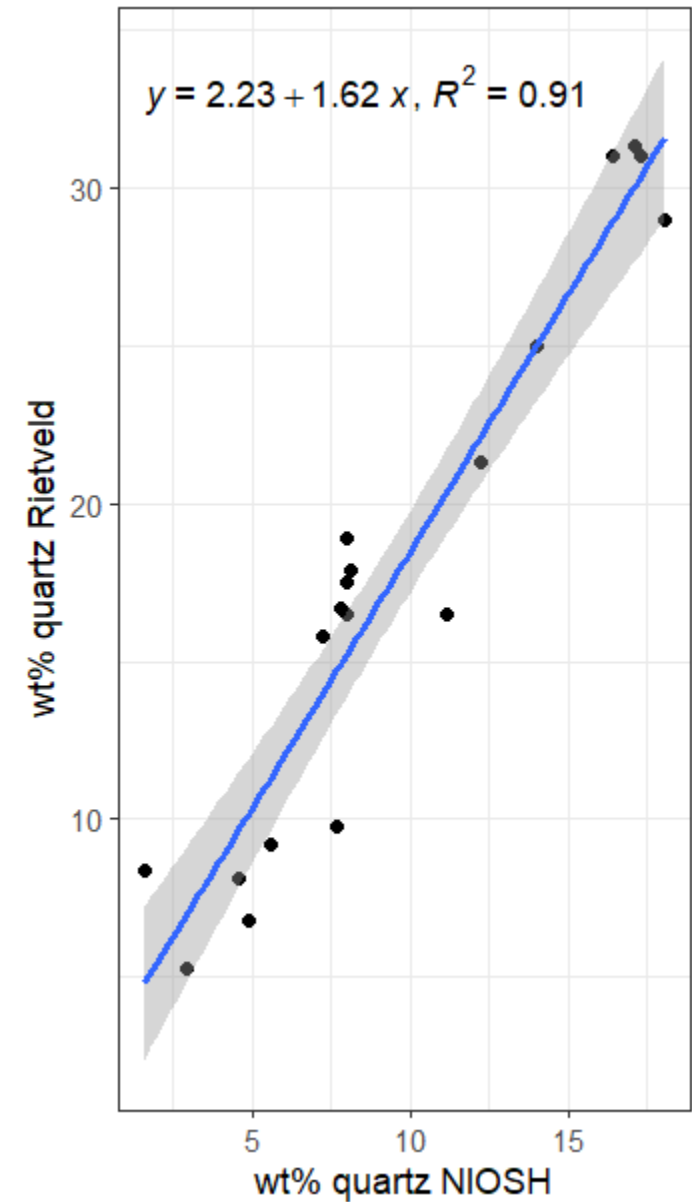
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## Rietveld Refinement

- / Multicomponent analysis
- / Fitting a calculated diffraction pattern to the observed data
- / Uses information on crystal structures from databases
- / In theory standardless



- Field samples from brick and concrete (n=19)
- Difference in slope



# Laboratory samples

/ Made from a mix of

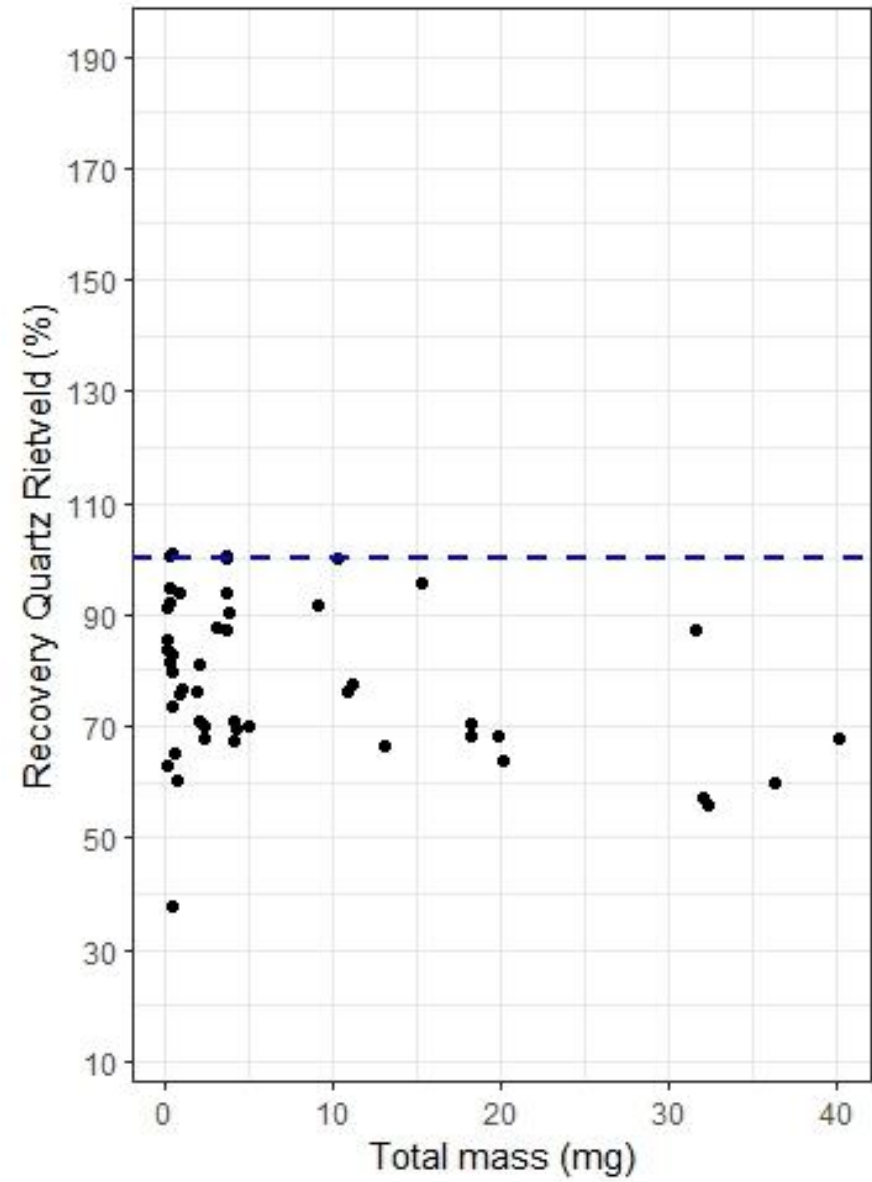
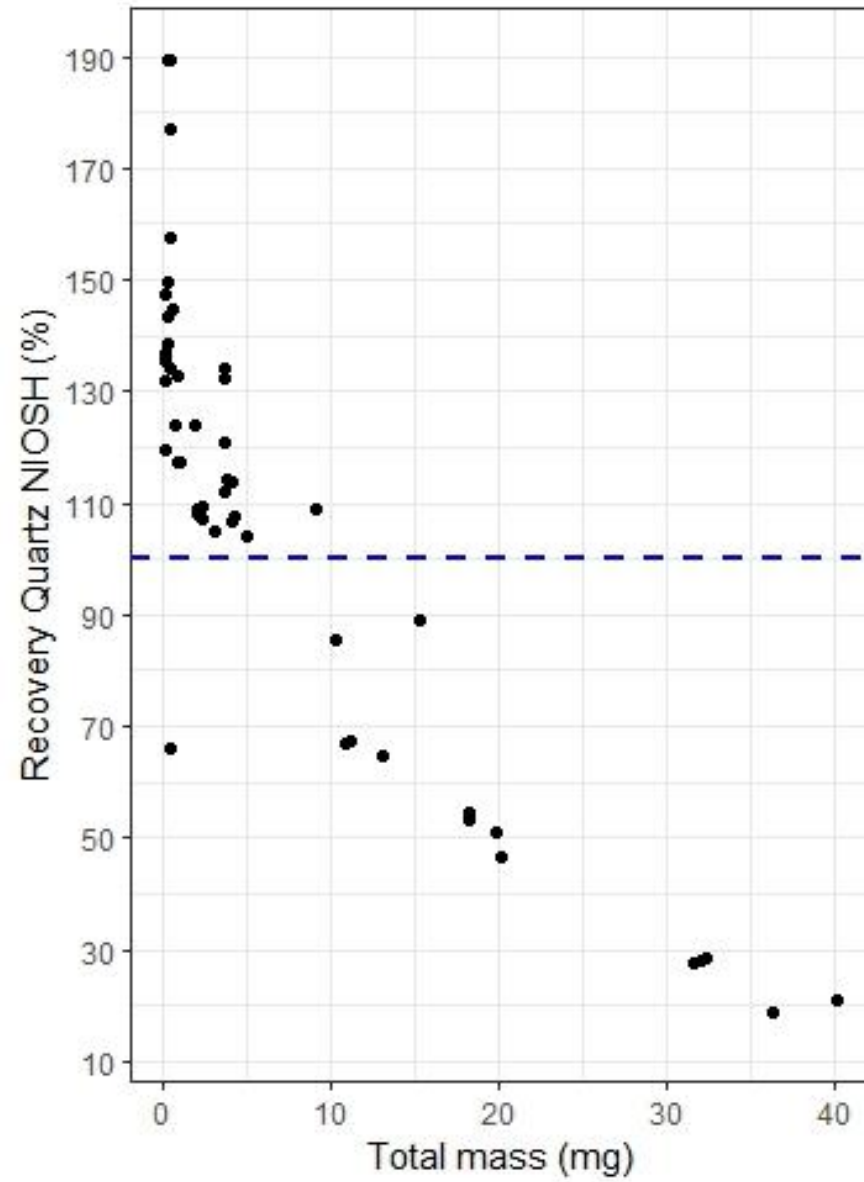
- anorthic feldspar (30-50 wt%)
- calcite (30-50 wt%)
- quartz(1-20 wt%)

/ Approx. 0.1 – 40 mg total mass loading

/ Respirable size distribution

/ Similar sample preparation to NIOSH 7500





# Is Rietveld useful?

## / Advantages

- Works on a higher sample loading
- Gives a fuller picture of the sample content and source of exposure
- Corrects for interferences

## / Disadvantages

- Is not standardless unless the samples is 100 % crystalline
- Require background knowledge to be used properly



# Thank you for your attention!

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