

QUANTITATIVE DETERMINATION OF ASBESTOS IN BULK INSULATION BY XRD

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Asbestos containing insulation and other construction materials occur in many buildings in the United States. Renovating or demolishing these buildings may release asbestos to the environment and expose people. The U.S. EPA has issued regulations to control and prevent releases. For regulatory purposes the cut-off concentration is one percent. This is not a health or risk based level, but rather is an attempt to distinguish materials manufactured with asbestos from those which contain incidental amounts of asbestos. Nevertheless, the one percent limit is important in measuring the concentration of asbestos in building materials, and is critical in enforcing the regulations.

Asbestos in bulk insulation is typically measured using polarized light microscopy (PLM). This method is fast, and can reliably determine the presence or absence of asbestos in almost all building materials. However, in order to comply with EPA regulations the concentration of asbestos must also be determined. PLM is not well suited for making quantitative measurements, especially on materials close to the one percent limit. Work at NEIC has shown that XRD can successfully deal with a variety of building materials. X-ray diffraction can be used to make quantitative measurements of asbestos content that are precise and unbiased, even near the one percent limit.

For the EPA, asbestos is the fibrous minerals chrysotile, amosite, crocidolite, actinolite, tremolite and anthophyllite. The EPA long ago issued an XRD method for bulk asbestos, but the method has not been thoroughly validated. The EPA method uses silver filters to present the sample to the diffractometer as a thin layer. Correction for absorption is based on the silver diffraction lines. Modern diffractometers with array detectors are much faster at acquiring data with an acceptable signal to noise ratio than the diffractometers available when the method was first issued. The use of an array detector makes the silver filter method reasonably efficient, with sample analysis taking less than one hour. Data and techniques will be presented that show the quality of the results that may be attained. Sample preparation will be discussed. Data on the bias and precision of the method will be presented.