

Advances in

ENVIRONMENTAL
MEASUREMENT
METHODS FOR
Asbestos

*Michael E. Beard and
Harry L. Rook, editors*



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for Asbestos*

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Foreword

This publication, *Advances in Environmental Measurement Methods for Asbestos*, contains papers presented at the symposium of the same name held 13–17 July 1997 in Boulder, Colorado. The symposium was sponsored by ASTM Committee D-22 on Sampling and Analysis of Atmospheres, and by the Environmental Information Association. The conference chairmen and co-editors of the publication were Michael E. Beard, Consultant, Raleigh, North Carolina, and Harry L. Rook, National Institute of Standards and Technology, Gaithersburg, Maryland.

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Overview

ASTM Committee D 22 on Sampling and Analysis of Atmospheres sponsors a variety of conferences and seminars to promote the exchange of information about monitoring various constituents and properties of air. One such conference is held periodically on the campus of the University of Colorado in Boulder and is known as the ASTM Boulder Conference. The 1997 ASTM Boulder Conference on Advances in Environmental Measurement Methods for Asbestos was held 13–17 July 1997 at the University of Colorado. This conference was co-sponsored by ASTM Committee D-22 and the Environmental Information Association.

The purpose of the conference was to focus on recent advances in research on measurement methods for asbestos in bulk building materials, as well as ambient, indoor, and work place air, water, and settled dust. The program included discussion of measurement methods, monitoring strategies, data interpretation, and quality assurance for asbestos measurements. It was the intent of the program to bring the disciplines of analytical chemistry together with investigators who are assessing exposure to asbestos in the environment and to promote better understanding of their mutual interests, needs, and limitations. The papers presented at the conference have been subjected to peer review, and those accepted are published in this ASTM Special Technical Publication.

Asbestos is a useful material and has been used as a component of many building materials. However, when asbestos fibers become airborne and are inhaled they may produce adverse effects such as asbestosis, lung cancer, and mesothelioma. The U.S. Environmental Protection Agency, the Occupational Safety and Health Administration, and various state and local governments have issued regulations to control exposure to the asbestos fibers. These governmental units have also named analytical methods and procedures that must be used to be in compliance with the regulations. These compliance methods address monitoring asbestos in drinking water, building materials, and in workplace and ambient air.

There are also asbestos-monitoring interests where no government regulation has been promulgated. Such an interest is asbestos in settled dust. While government regulations generally address visible deposits of dust in areas where asbestos-containing materials have been identified, there have been no analytical methods for sampling and analysis of asbestos in this medium. Likewise, there are no regulatory monitoring or control strategies other than requiring that all visible dust should be cleaned. ASTM has addressed these needs by developing draft methods for asbestos in settled dust, and two have become ASTM standards (D 5755: Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations; and D 5756: Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Concentration).

Analytical methods are constantly being reviewed and revised by users to meet new or special analytical needs. ASTM methods are subject to this review process and are required to be re-approved every five years. Governmental compliance monitoring methods for asbestos have proved to be more difficult to amend. Although regulations require periodic review, technical improvements may not be adopted because they may increase the cost of the analysis and thus the burden to the public. While the government will accept results from a more stringent analytical procedure, they are reluctant to require procedures considered burdensome to the public. Where there is no standard method or governmental compliance monitoring procedure, the analytical needs are filled by the so-called “state of the

art procedure.” These procedures are commonly used by laboratories to meet the demanding analytical requirements of a wide variety of materials submitted for analysis.

While these “state of the art procedures” may ultimately become the practice of all and be incorporated into the regulations, their adoption may lag in meeting the immediate monitoring needs of the analyst. It is this need that the 1997 ASTM Boulder Conference addresses. Many asbestos-monitoring techniques have been developed for problem materials such as vinyl asbestos floor tiles, bulk samples with less than 10% asbestos content, and asbestos in settled dust. The goal of this conference was to provide a forum for these state-of-the-art improvements and to have them published for wider distribution and dissemination. This Special Technical Publication will provide documentation of this forum and serve as a guide for monitoring asbestos using improved analytical techniques. This publication will be especially useful to those unable to attend the conference and as a foundation for those who are continuing research to meet these analytical needs.

The Conference was organized into technical sessions dealing with four measurement areas: (1) Measurement Methods for Asbestos in Bulk Building Materials; (2) Measurement Methods for Asbestos in Ambient, Indoor, and Workplace Air; (3) Measurement Methods for Asbestos in Water; and (4) Measurement Methods for Asbestos in Settled Dust. Papers describing analytical methods, monitoring strategies, and quality assurance procedures were presented and discussed.

The session on Methods for Asbestos in Bulk Building Materials included discussions concerning polarized light microscopy (PLM), X-ray diffraction (XRD), and transmission electron microscopy (TEM) techniques for analysis of these materials. The performance of regulatory methods in the analysis of a variety of bulk building materials, soils, and paints was presented and discussed. Shortcomings of the regulatory procedures were highlighted, and research to develop improvements, especially for the 1% regulatory statute, was presented.

The session on Asbestos in Ambient, Indoor and Workplace Air included presentations on OSHA, EPA, and ISO methods for monitoring airborne asbestos by either phase contrast microscopy (PCM) or TEM. Interesting research on techniques for determining fiber length/diameter distributions and the depth of penetration of fibers into membrane filters were also presented.

The session on Measurement Methods for Asbestos in Water reviewed EPA and American Water Works Association methods for asbestos in drinking water and research on improved sample preparation techniques. These small fibers dictate the use of TEM for analysis. This session also includes the editor’s choice for most interesting title in the conference, namely “Sludge, Crud and Fishguts: Creative Approaches to Non-Standard Asbestos Water Analysis.” This title epitomizes the innovative spirit and talent that analysts must exercise in dealing with a wide variety of environmental monitoring needs.

The final session on Measurement Methods for Asbestos in Settled Dust was perhaps the most controversial session in the conference. Analytical methods employing TEM developed by ASTM Subcommittee D 22.07 for monitoring asbestos in settled dust and monitoring strategies and results were presented. Many asbestos in settled dust monitoring efforts have required litigation for final interpretation of datasets. Some of the presentations in this session exemplify the diversity of opinions in this area. Additional studies are needed in this field to determine the effect of human, mechanical, and natural activity on generating asbestos aerosols from settled dusts. Research is also needed to better define the quantity of airborne asbestos that constitutes an environmental exposure hazard.

The 1997 ASTM Boulder Conference on Advances in Environmental Measurement Methods for Asbestos served as a focal point for issues related to the needs for improved monitoring techniques for asbestos. This ASTM Special Technical Publication will serve as a

documentaiton for our collective understanding of these issues as they were at the time of the conference. It is hoped that the papers published here will guide others in understanding these monitoring issues and lead to research for further improvements for us all.

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