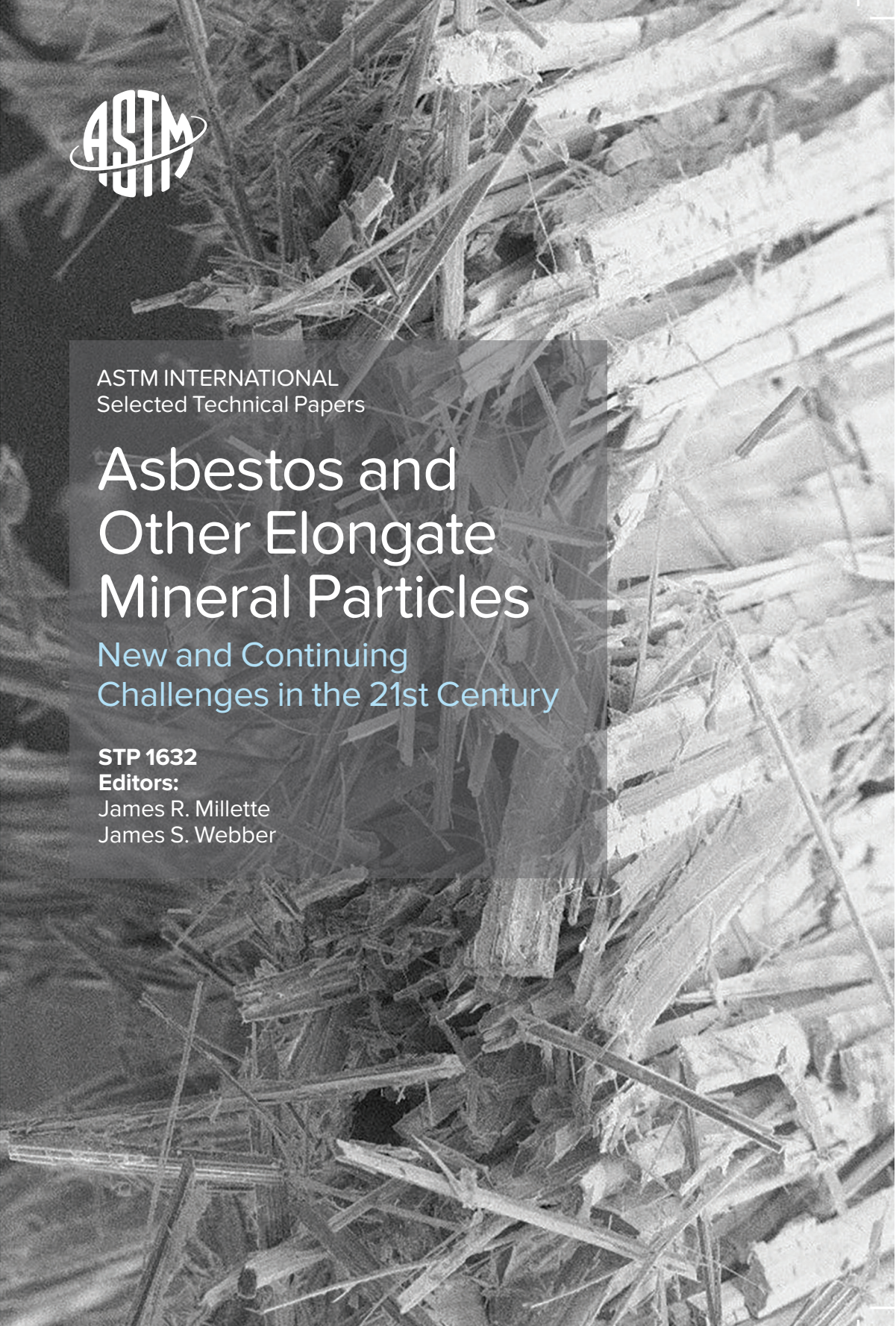

ASTM INTERNATIONAL
Selected Technical Papers

Asbestos and Other Elongate Mineral Particles

New and Continuing Challenges in the 21st Century

STP 1632
Editors:
James R. Millette
James S. Webber

SELECTED TECHNICAL PAPERS
STP1632

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Asbestos and Other Elongate Mineral Particles—New and Continuing Challenges in the 21st Century

ASTM STOCK #STP1632
DOI: 10.1520/STP1632-EB

ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959
Printed in the U.S.A.

Library of Congress Cataloging-in-Publication Data

Names: Millette, James R., editor. | Webber, James S., editor. | ASTM International.

Title: Asbestos and other elongate mineral particles : new and continuing challenges in the 21st century / editors James R. Millette, James S. Webber.

Description: West Conshohocken, PA : ASTM International, [2021] | Includes bibliographical references. | Summary: "This compilation of Selected Technical Papers, STP1632, Asbestos and Other Elongate Mineral Particles---New and Continuing Challenges in the 21st Century, contains peer-reviewed papers that were accepted for a symposium to be held July 25--29, 2022, in Burlington, Vermont, USA. The symposium is sponsored by ASTM International Committee D22 on Air Quality and Subcommittee D22.07 on Sampling, Analysis, Management of Asbestos, and Other Microscopic Particles"-- Provided by publisher.

Identifiers: LCCN 2021024423 (print) | LCCN 2021024424 (ebook) | ISBN 9780803177109 (paperback) | ISBN 9780803177116 (ebook)

Subjects: LCSH: Asbestos fibers--Environmental aspects--Congresses. | Inorganic fibers--Environmental aspects--Congresses.

Classification: LCC TD196.A78 A79 2021 (print) | LCC TD196.A78 (ebook) | DDC 363.17/91--dc23

LC record available at https://lccn.loc.gov/2021024423

LC ebook record available at https://lccn.loc.gov/2021024424

ISBN: 978-0-8031-7710-9

ISBN-EB: 978-0-8031-7711-6

Peer Review Policy

Each paper published in this volume was evaluated by two peer reviewers and at least one editor. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM International Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of the peer reviewers. In keeping with long-standing publication practices, ASTM International maintains the anonymity of the peer reviewers. The ASTM International Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM International.

Citation of Papers

When citing papers from this publication, the appropriate citation includes the paper authors, "paper title," in *STP title*, book editor(s) (West Conshohocken, PA: ASTM International, year), page range, paper doi, listed in the footnote of the paper. A citation is provided on page one of each paper.

Printed in Hanover, PA
December, 2021

Foreword

THIS COMPILATION OF Selected Technical Papers, STP1632, *Asbestos and Other Elongate Mineral Particles—New and Continuing Challenges in the 21st Century*, contains peer-reviewed papers that were accepted for a symposium to be held July 25–29, 2022, in Burlington, Vermont, USA. The symposium is sponsored by ASTM International Committee D22 on Air Quality and Subcommittee D22.07 on Sampling, Analysis, Management of Asbestos, and Other Microscopic Particles.

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Overview

ASTM International Committee D22 on Air Quality sponsors a variety of conferences and seminars to promote the timely exchange of information about monitoring various constituents and properties of air. Since 1986, the Johnson Conferences, usually held every three years in the beautiful summers of northern Vermont, have served as open forums for the dissemination of current thinking on asbestos issues. These conferences have encouraged forthright presentations and discussions of novel ideas as well as controversial issues concerning asbestos and related fibers. Hundreds of presenters and attendees have come from around the globe from government agencies, academia, large corporations, and small private practices. These conferences have generated lively exchanges of ideas that have shaped many of the asbestos monitoring methods and strategies used today throughout the world.

In 2019 a decision was made to rename the "Johnson Conference" the "Rook Conference" in honor of Dr. Harry S. Rook, chair of the first eight Johnson Conferences. It was also decided to invite individuals or groups of individuals who were accepted as presenters at the 2020 Conference to submit full scientific papers to be peer-reviewed and published in ASTM's Selected Technical Papers (STP), an online and printed publication for the international scientific and engineering community. Although originally planned to be published after the 2020 meeting, repeated postponements of the Rook Conference due to the Covid-19 pandemic has caused this STP (1632) to be finished well before the meeting takes place. Undoubtedly some issues discussed within this STP will receive updated and expanded coverage in the presentations at the impending Rook Conference scheduled for 2022.

As of June 2021, there were 14 active standards (methods, practices, and guides) under the jurisdiction of ASTM International Subcommittee D22.07:

1. D5755 Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading
2. D6058 Standard Practice for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment
3. D6281 Standard Test Method for Airborne Asbestos Concentration in Ambient and Indoor Atmospheres as Determined by Transmission Electron Microscopy Direct Transfer (TEM)

4. D6480 Standard Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Analysis for Asbestos Structure Number Surface Loading by Transmission Electron Microscopy
5. D6620 Standard Practice for Asbestos Detection Limit Based on Counts
6. D7201 Standard Practice for Sampling and Counting Airborne Fibers, Including Asbestos Fibers, in the Workplace, by Phase Contrast Microscopy (with an Option of Transmission Electron Microscopy)
7. D7390 Standard Guide for Evaluating Asbestos in Dust on Surfaces by Comparison Between Two Environments
8. D7521-16 Standard Test Method for Determination of Asbestos in Soil
9. D7712 Standard Terminology for Sampling and Analysis of Asbestos
10. D7886 Standard Practice for Asbestos Exposure Assessments for Repetitive Maintenance and Installation Tasks
11. E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects
12. E1494 Standard Practice for Testing Physical Properties of Friable Surfacing Materials
13. E2356 Standard Practice for Comprehensive Building Asbestos Surveys
14. E2394 Standard Practice for Maintenance, Renovation, and Repair of Installed Asbestos Cement Products

ASTM standard analytical methods, practices, and guides are constantly being reviewed and revised by the members of D22.07 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.

In addition to the current established standards, there are 13 proposed new standards that are being pursued by members of D22.07. These "standards-in-progress" encompass a diverse set of topics including: airborne carbon nanotubes, vermiculite, cosmetic and pharmaceutical talc, a fluidized bed aerosol segregator, non-friable organically bound (NOB) materials, natural occurrences of asbestos (NOA), scanning electron back scattering diffraction techniques, artificial intelligence for counting fibers, use of phase contrast microscopy for determining release of fibers from cement product surfaces, and mineral fibers in tissue.

The last ASTM STP (1342) dealing with asbestos followed the ASTM Boulder Conference on Advances in Environmental Measurement Methods for Asbestos, which was held July 13–17, 1997, at the University of Colorado. The Boulder Conference was co-sponsored by Committee D22 and the Environmental Information Association. Co-editors for 1999 STP1342, with the same title as the Conference, were Michael E. Beard, Consultant, Raleigh, NC, and Harry L. Rook, National Institute of Standards and Technology, Gaithersburg, MD. In their Overview, they stated that STP1342 would serve as a documentation of the collective understanding of asbestos methods as they were at the time of the conference. They hoped that their

STP would guide others in the understanding of asbestos monitoring issues and lead to research for further improvements for us all.

As Mr. Beard and Dr. Rook had hoped, the last two decades have witnessed considerable research in the area of asbestos monitoring as well as an expansion of the field to include management of asbestos materials, other mineral fibers, and even man-made fibers such as carbon nanotubes. Subcommittee D22.07 that dealt primarily with asbestos measurement methods in 1997 has been expanded and renamed "Sampling, Analysis, Management of Asbestos, and Other Microscopic Particles" to provide a better characterization of its broader focus. Health concerns over exposures to the fibers of the minerals winchite, richterite, and erionite (not included in the list of six asbestos minerals originally named in regulations) have spurred an interest in the more general studies of elongate mineral particles (EMP), as they are called in the 2011 NIOSH Research Roadmap, Bulletin 62, and subsequent documents.

Government agencies in the United States and abroad have issued occupational and environmental regulations to control exposure to the asbestos fibers. These governmental units have often mandated analytical methods and procedures for compliance with their regulations. However, with each new advance in technology, a new, more specific analytical procedure may become available. Thus, an analyst using an existing method may find a more efficient way to proceed. There are also interests in monitoring for asbestos (or EMPs) where no government regulation has been promulgated. It is in these areas that the meetings, conferences, and publications of Subcommittee D22.07 bring together professionals who work on consensus approaches to these issues.

This STP, containing papers accepted after being subjected to peer review through the ASTM editorial process, has been organized into technical sections dealing with six areas of interest: (1) Medical Research, Dose/Response, Toxicology; (2) Sampling, Exposure Assessment; (3) Environmental Monitoring; (4) International and Domestic Analytical Methods; (5) Soils, Natural Occurrences of Asbestos, and Talc Products; (6) Mineralogy, Asbestos Analysis, Quality Assurance, and Training.

In the first section, there is a general discussion of the current research on non-occupational exposure to asbestos, as well as a campaign to evaluate exposure of workers and the general population to EMPs. In addition, there is presentation of specific data on the development of asbestos-related lung diseases in French miners exposed to actinolite asbestos. On the toxicology side, there is a report of the size distributions of amphibole EMPs used in intra-peritoneal injection studies on rats.

The second section provides data on asbestos exposure resulting from maintenance of apartments with asbestos-containing sprayed ceilings and on fiber release data from a number of simulation chamber studies.

The third section contains analytical studies involving extensive data sets concerning the background levels of asbestos detected throughout the city of Houston, Texas, and personal, baseline, perimeter, and off-site air monitoring data from large-scale construction at a dam site in California that was in an area of NOA.

Asbestos bulk sample analysis methods used in the United States and how they relate to the intricacies of US regulations are dissected in the fourth section. Two comparisons, one of air and water elutriation sample preparation procedures for amphiboles and another on the size separations of amosite by filtration and shaking methods, are presented. There are papers on the regulation of asbestos in soil, waste and recycled materials in Western Australia, and a European proposal on thermal, chemical, and biological processes for the destruction of asbestos. Another paper provides a European perspective and comparison of detection limit and limit of quantification in microscopical asbestos analysis methods. New ideas about artificial intelligence–driven, automated phase-contrast microscopy counting of fibers on air sample filters are presented.

The fifth section contains one paper about measuring low levels (less than 1%) of amphibole asbestos fibers in chrysotile asbestos-containing products and three papers dealing with different aspects of asbestos in cosmetic talc.

The sixth and final section includes a general discussion of the classification of amphiboles and specific presentations on the energy dispersive x-ray analysis as well as on selected area electron diffraction techniques used in the transmission electron microscope analysis of asbestos. A report on the inter-laboratory validation of ASTM D6480, the asbestos standard test method for wipe sampling, and a review of the work of D22 on electronic learning modules round out this section.

ASTM STP1632 will serve as a useful reference for scientific information, technical ideas, and data interpretations related to issues of interest to ASTM International Subcommittee D22.07 as they were at press time. The editors agree with the sentiment of the wish expressed by Mike Beard and Harry Rook in STP1342: "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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