

# Index

## A

### Actinolite

- Carcinogenicity, 120
- Composition, 122, 142, 160
- Presence in vermiculite, 125

### Amosite

- Composition, 122, 142-145
- Definition, 107
- Origin of term, 121
- Epidemiology, 12, 94

### Amphibole (*see also* Actinolite, Amosite, Anthophyllite, Crocidolite, Cumingtonite, Grunerite, Riebeckite, Tremolite), 121-122, 142- 145

- Composition, 121-122, 142-145
- Definition, 121, 142-145
- Identification of, 123
- Mineral classification, 121-122
- Occurrence, 167

### Anthophyllite

- Characterization, 9, 122
- Composition, 122, 142-145
- Epidemiology, 74-75, 94

### Asbestiform, definition of, 8

### Asbestos

- Actinolite (*see* Actinolite)
- Amosite (*see* Amosite)
- Analysis techniques (*see* Methods)
- Anthophyllite (*see* Anthophyllite)
- Aspect ratio (*see* Aspect ratio)
- Blue (*see* Crocidolite)
- Brown (*see* Amosite)

### Asbestos *cont.*

- Carcinogenic potential, 119
- Chemical attack, 123
- Chrysotile (*see* Chrysotile)
- Crocidolite (*see* Crocidolite)
- Definitions, 121-122, 139-145,  
176, 177
- Generic term, 8
- Description, 121, 141-145
- Discharge into the environment,  
sources of, 120
- Dust standards, 12
- Epidemiology (*see* Asbestosis,  
Cancer, Mesothelioma)
- Exposure
  - Defining hazardous conditions,  
30, 31
  - Dose-response relationships, 20-  
24
  - Environmental, 31
  - Evaluation by midget impinger,  
7
  - In schools, 30-31
  - Lung defense mechanisms, 24-  
26
  - Lung clearance, 26-28
  - Nonoccupational, 120
  - Zero level concept, 30
- Fibers (*see also* Fiber)
  - Carcinogenic potential (*see also*  
Asbestosis, Cancer, Me-  
sothelioma), 119
  - Identification, 126-132
  - Geographic distribution, 6, 42, 53-  
54

Asbestos *cont.*

- Grunerite (*see* Grunerite)
- Health effects (*see also* Asbestosis, Cancer, Mesothelioma), 7, 56–100, 118–120
  - On immunological system, 25
- Health hazards (*see also* Asbestosis, Cancer, Mesothelioma), 7, 56–100, 118–120
  - In households of exposed workers, 84
  - Nonoccupational exposure, 120
- History of usage, 53–54
- Lung burden, 26–28
- Lung defense mechanisms, 24–26
- Minerals
  - Characterization, 9, 54–56, 121–123, 140–145
  - Chemical formulas, 54–56, 121–122, 140–145
  - Geological distribution, 56
  - Production, 54–55
  - Sources, 53–55
  - Uses, 52, 58
- Mining and quarrying operations, 28–29
- Nonoccupational exposure, 120
- Occupational exposure, permissible levels, 43
- Pipe, 20
- Production, 91
- Properties of, 6
- Related mortality (*see also* Asbestosis, Cancer, Mesothelioma), 60–97
  - Comparisons between miners/millers and trades workers, 72–77
  - Miners and millers, 61, 70, 72–80
  - Trades workers, 58–80
- Riebeckite (*see* Riebeckite)
- Risk assessment, 23–24
- Standards (*see* Standards)
- Substitutes, 98

Asbestos *cont.*

- Threshold limit value (TLV), American Conference of Governmental Industrial Hygienists (ACGIH) (*see* Standards)
- Tremolite (*see* Tremolite)
- Varieties, 121–122
- White (*see* Chrysotile)
- Asbestosis, 10–13, 56–98, 118
  - Cause (asbestos exposure), 12
  - Definition, 118
  - Dose-response (*see* Dose-response relationship)
  - Fiber concentrations, criteria for standards
    - American Conference of Industrial Hygienists (ACGIH), 10
    - British Occupational Hygiene Society (BOHS), 11
    - Dreessen's standard, 10
    - Pennsylvania studies, 12
- Aspect ratio, fiber, 8, 34–36, 107–109, 119, 125, 146
- Asbestos, 8, 34, 36, 108–109, 119, 146
  - Definition of a fiber, 35, 105–107, 125
  - Fibers extracted postmortem from human lungs, 32, 108–109
  - Inhalation by humans, 36
  - Standards, 35
  - U.S. government definitions, 106–107

**B**

- BOHS standard (*see* Standards)

**C**

- Califano, Joseph, on occupational disease, 84, 86

- Cancer (*see also* Mesothelioma), 52, 56-97
- Bronchogenic (*see also* Cancer, lung), 13-16, 56-57
    - Smoking and asbestos-related cancer, 39-40, 61
  - Homestake, South Dakota, miners, 15
  - In the insulation industry, 13, 62-69, 88, 119
  - In the Quebec asbestos industry, 12, 13-14, 18, 82-86
    - Miners, 6, 14, 18, 70, 74-77, 82, 85
    - Textile workers, 12, 13, 82
  - Lung, 13-16, 56-97, 119
  - Gastrointestinal, 20, 57, 62-69, 74-77, 78, 84-88, 93
  - Gold miners, 15
  - Mortality data, 60-97
  - Mortality rates, 85-86
    - Five-nation study, 78
    - Seventh Day Adventists, 16
- Chatfield, Eric J., 118-138
- Chrysotile
- Composition and structure, 9, 121-122, 140-141
  - Epidemiology (*see also* Asbestosis, Cancer, Mesothelioma), 12, 14, 91-95
  - Identification by transmission electron microscopy (TEM), 128
  - In serpentine rock, 120
  - In unpaved roads, 120
  - Solubility and thermal stability, 123
- Cigarette smoking, effect on asbestos-related disease, 39-40, 43, 60-61, 119
- Cleavage fragments
- Carcinogenicity, 123
  - Counted by NIOSH method, 110
- Clifton, Robert A., 139-147, 158-174
- Cossette, Marcel, 5-30
- Crocidolite
- Composition, 121-122, 142-145
  - Electron microscopy analysis, 124
  - Epidemiology (*see also* Asbestosis, Cancer, Mesothelioma), 13, 79, 92
  - Imported from South Africa, 59
- Cumingtonite-grunerite
- Composition, 9
  - Epidemiology, 123-125
- D**
- Dose-response relationships, 20-24, 31
- Dunnom, Donald D., 188-192
- E**
- Ellis, Wayne P., 201-205
- Epidemiological studies (*see also* Asbestos, Asbestosis, Cancer, Mesothelioma), 7-20, 56-97
- Comparative, 91-96
  - Mortality rates (*see* Mortality data)
- Exposure measurement, criteria for, 119
- F**
- Fiber
- Aggregates, effect on fiber counting, 34
  - Asbestos
    - Counting method, National Institute for Occupational Safety and Health (NIOSH), 106-107, 111
    - Cleavage fragments, 107, 110
    - Effect of particle length and width, 111-113
    - Problems with, 115
  - Definition (identification) by electron and optical microscopy, 125-129

**Fiber cont.****Asbestos cont.**

Discharged into the atmosphere,  
120

In mines, mills, and urban areas,  
36-37

Microscopy (*see also* Methods),  
133

Standard fiber, 107

Carcinogenicity, 110, 119

Pott model, 120

Classification protocol, 129

**Definition**

Aspect ratio (*see also* Aspect  
ratio), 35

Diameter and length, 34-35

Standards, nongovernment

Asbestosis Research Council  
of Great Britain (ARC), 34-  
35

ASTM, 35

International Labor Office, 34

Johannesburg Convention, 34

Standards, U.S. government  
regulatory

Occupational Safety and  
Health Administration  
(OSHA), 34-35

Mining Enforcement and  
Safety Administration  
(MESA), 34

National Institute for Occu-  
pational Safety and Health  
(NIOSH), 35, 105-110

Dimensions and carcinogenicity,  
110

Minimum size of interest, 120

**Monitoring**

By optical microscopy, 113

By X-ray diffraction, 181-182

Effect of mineralogy on, 113

Effect of mineral habit on, 114

Effect of processing on, 115

U.S. Bureau of Mines, 165

**Fiber cont.**

Naturally occurring inorganic fi-  
ber, 8

Standard fiber, 106

Visibility, 36

**Fibers, airborne**

Aerodynamic behavior, 36

Extracted from human lungs, as-  
pect ratio of, 32

Minimum concentration of con-  
cern, 121

Nonasbestos, in air, survey pro-  
gram, 185-187

Tumor-inducing, 132

Fibril, definition, 8

Fibrosis, 118

Filter pads, asbestos-bearing, 73, 78

Fragments, cleavage, 107

**G**

Glossary, for health-related silicates,  
201-205

**Grunerite**

Composition, 142-145

**H**

Hazards, health (of exposure to as-  
bestos) (*see also* Asbesto-  
sis, Cancer, Mesothelioma), 7

Hemenway, David R., 151-157

Homestake, South Dakota, gold  
miners, lung cancer, 15

**I**

Impinger, midget, for measurement  
of airborne particles, 7

**K**

Knight, Geoffrey, 184-187

Kuntze, Richard A., 139-147

## L

- Levadie, Benjamin, editor, 1-2
- Lizardite, 123
- Lung cancer, 13-16, 56-97, 119

## M

- Membrane filter method (*see* Methods)
- Mesothelioma (*see also* Cancer), 17-20, 56-97, 119
  - In animals, 17
  - In Canada, 17-20, 57-86, 91-97
  - In England, 62-69, 73, 96
  - In Finland, 74, 78, 94
  - In South Africa, 61, 79-82, 92-95, 97
  - In Switzerland, 70, 73
  - In Turkey, 20, 120, 184
  - In the United States, 17-20, 57-78, 81, 84-97
  - In Western Australia, 76-77, 80-81, 92, 94-95
- Materials, producing, 17
- Zeolites, as a cause, 20, 120, 184
- Methods, 33
  - Membrane filter
    - Limitations, 119
    - Problems with, 115
    - Useful in, 139
  - Microscopy, electron, 33, 115, 127-135
    - Scanning, 127-134
      - Preferred for measuring asbestos concentrations, 115
      - Resolving power, 127
    - Transmission, 127-134
      - Comparison with phase contrast microscopy, 112
      - For asbestos fiber identification, 123
      - Resolving power, 128

Methods *cont.*

- Microscopy, optical, 33, 126
  - Fibers visible by, 113
  - Phase contrast, 39, 126, 132-134
  - Polarized light, 33
  - Resolving power, 112
  - Selected area electron diffraction (SAED), 128-133
  - X-ray diffraction, 33, 37, 39, 127-131, 152, 182
- Mortality data, (*see also* Asbestosis, Cancer, Mesothelioma), 60-97

## N

- NIOSH fiber
  - Definition, 106-107
  - Discussion of, 107-115, 176-178

## O

- OSHA monitoring procedures for talc, views
  - National Bureau of Standards, 166
  - U.S. Bureau of Mines, 166

## P

- Particle counting
  - Correlation of optical and electron microscopy methods, 37
  - Limitations of microscopy, 37
- Particle identification
  - Techniques, 33
  - Instrumentation, 37-39
- Particles, airborne, aerodynamic diameter, 31-32, 34-36
- Particulates, defining for monitoring, 8, 31-36
- Pneumoconiosis, 10
- Potstone, 159
- Pott's model (of carcinogenic potency), 120-121, 134, 135

## Q

Quartz analysis, by X-ray diffraction, 152

## R

## Regulations

Anticipated thrust of, 183

Effects of

On industries, 175-176, 178-179

On mining, 175-176, 178-179

Reserve Mining Co., 28, 72, 99

## Riebeckite

Composition, 142-145

Ross, Malcolm, 51-104, 139-147, 193-197

## S

School asbestos exposure, 30-31, 42, 90

Selikoff, I., epidemiological studies, 15-16, 86-88, 120

Serpentine, 9, 166

Composition, 121-122, 140-141

Chrysotile in, 120

Seventh Day Adventists, mortality from cancer, 16

## Silica minerals

Definition, 188-192

Mortality from, 89

## Silicon dioxide

Common forms, 151-152

Crystalline polymorphs, 152-153

Definitions, 152-156

Silicosis, hard rock mining, 15

Smoking, (*see* Cigarette smoking)

Soapstone, 159

## Standards

Asbestosis Research Council of Great Britain (ARC), 34-35

Aspect ratio, fiber, 35

Standards *cont.*

American Conference of Industrial Hygienists (ACGIH), 10

ASTM, 35

British Occupational Hygiene Society (BOHS), 11, 12

Dreessen, 7, 9, 10

International Labor Office, 34

Johannesburg Convention, 34

McDonald, 30

Mining Enforcement and Safety Administration (MESA), 34

National Institute for Occupational Safety and Health (NIOSH), 35, 105-110

Occupational Safety and Health Administration (OSHA), 34-35

Pennsylvania studies, 12

Quebec asbestos mining industry, 14

Threshold limit value (ACGIH), 10

Steatite, 159

Synergism, cigarette smoking and asbestos, 40

## T

## Talc

Asbestos in, 165, 166

Definitions of, 159

What talc is not, 164

Fiber content and sources, 164

French chalk, 161

Minerals occurring in, 159-160

Mining, comparative studies, 181

Natural production of, 159

Steatite, 161

Talcum, 161

Tremolitic talc, 167-171

Uses of, 161, 163-164

World production of, 161

Terminology, mineral, 158, 201-205

Thompson, C. Sheldon, 175-183

Tremolite  
 Composition, 122, 142–145  
 Occurrence of, 165–166  
     In asbestos, 166, 170  
     In rock, 169  
     In talc (*see also* Talc), 160  
 Turkey, environmental asbestos exposure, 20, 184  
 Tridymite, definition, 152

**W**

Water and asbestos-related disease, 83

Gastrointestinal cancer, 20, 57  
 Wylie, Ann G., 105–117

**X**

X-ray diffraction (*see* Methods)

**Z**

Zeolites, and mesothelioma, 20, 120, 184