

# Width Distributions of Asbestos and Non-Asbestos Amphibole Minerals

D.R. Van Orden<sup>a</sup> R.J. Lee<sup>a</sup> K.A. Allison<sup>a</sup> J. Addison<sup>b</sup>

<sup>a</sup>RJ Lee Group, Inc., Monroeville, PA, USA

<sup>b</sup>John Addison Consultancy, 196 New Village Road, Cottingham, HU16 4NL, UK

## Key Words

Asbestos · Non-asbestos · Amphibole · Width · Aspect ratio · Morphology

## Abstract

Amphibole asbestos fibers and non-asbestos amphibole particles have been shown to have different size characteristics, in addition to their morphological differences. There is a tendency, however, among laboratories and some regulators to ignore the morphological differences and to simply rely on a minimal aspect ratio to determine whether a particle is an asbestos fiber. This study, part of a larger evaluation of amphibole minerals, was undertaken to provide supporting size data that can be used to identify populations of asbestos and non-asbestos amphibole minerals. The asbestos samples average 0.27  $\mu\text{m}$  in width with 90% thinner than 0.5  $\mu\text{m}$ . In contrast, the non-asbestos amphiboles average 0.97  $\mu\text{m}$  wide with 75% wider than 0.53  $\mu\text{m}$ . The average aspect ratios were 76:1 for asbestos and 16:1 for the non-asbestos samples. These data confirm the historical distinctions of asbestos and non-asbestos amphibole minerals.

## Introduction

Asbestos is a commercial term applied to a group of naturally occurring minerals that have grown in a specific form and that exhibit characteristics of flexibility (tensile strength), large surface area, and resistance to heat and chemical degradation. The minerals have been woven into fabrics, ropes, braids, etc. or used as filler in molded or sprayed products and as fiber reinforcement in cement. Asbestos is usually defined as: "(1) A collective mineralogical term encompassing the asbestiform varieties of various minerals; (2) an industrial product obtained by mining and processing primarily asbestiform minerals." [1]. The commercial term "asbestos" refers to chrysotile and five amphibole minerals.

There are many minerals that can grow into fibers, but only six have been regulated as asbestos. Of these six, the regulated amphibole minerals (riebeckite asbestos, grunerite asbestos, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos) are part of a complex assemblage of minerals that have almost identical crystal structures, but variable chemical compositions. The amphibole minerals occur in a variety of forms, ranging from fibrous to acicular to massive particles [1]. Amphibole nomenclature has been standardized and can be found in Leake et al [2].