The Presence of Asbestos in Talc

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Quantitative Methods in Rocks and Minerals

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July 17, 2010

Abstract

This research paper investigates the occurrence of asbestos in talc. There has been much gossip in the past over whether talc products that are made available for every day household needs are in fact hazardous to humans. To prove or disprove this claim, an investigation as to whether asbestos is naturally present in the mineral talc must first be conducted. This analysis informs the reader if there really should be any cause for alarm when they use talc products. A thirty year old rumor will be laid to rest as the truth is finally revealed.

The Presence of Asbestos in Talc

Talc is one of the softest minerals known to man. A fingernail can penetrate its outer surface with modest force due to its hardness of 1 on Mohs scale. That rating is only shared by two other minerals; one being the widely known graphite used every day in pencils and molybdenite (Loomis, 1948). The most defining characteristics of talc are color and texture. Talc's color can range between white, gray, or a pale green hue (Loomis, 1948), and it leaves a white streak on any surface it comes in contact with. The distinctive greasy and chalky quality of it allows it to be identified as the mineral talc before further examination is complete.

There is much speculation over the formation of talc. Through the years it has been reduced to two theories. The first hypothesis states that talc is a secondary mineral because it is thought that talc is derived from exposure to magnesium silicates, such as pyroxenes and amphiboles. Then water is inserted into the solution, creating a hydrous magnesium silicate (Loomis, 1948). Incidentally, that is the chemical name for talc. This kind of talc will appear in the same areas as the original magnesium silicates, both metamorphic minerals, giving cause for leading petrologists to hypothesize that talc arises through metamorphic processes. The second theory is that talc forms amid dolomite and igneous rocks when water containing silica engulfs the dolomite (Loomis, 1948). Yet there are more petrologists supporting the first hypothesis due to its reasonableness.

Talc is one of the most commonly used minerals. In the United States, it is utilized in the process of creating ceramics, paints, paper, plastics, rubber, cosmetics, roofing, and many other goods (U.S. Talc-Baby Powder and Much More, 2000). The United States is the country with the

largest production of commercial talc (Bateman, 1951). Within the United States, New York State is the leading producer because of its large deposits in St. Lawrence County (Loomis, 1948). North Carolina has several large deposits of its own. They are found in a northwestern belt along the mountains, the Murphy marble belt, and a southwestern belt (Lamey, 1966).

There are some health issues related to talc. Studies have been conducted showing that there is a strong correlation between the usage of household talc products, i.e. talcum powder, and ovarian cancer. Women who use talcum powder each day seem to have almost three times the chance of developing ovarian cancer (Risks of Talcum Powder, 2003). This statistic has confounded scientists and further studies are being conducted on this subject. Also, lung problems such as cancer and even death can result from the inhalation of baby powder. Talc tends to stick easily and can fasten to the lining of the lungs and interfere with the body's natural process of breathing.

Asbestos is one of the most complex and distinctive group of minerals. Generally, it consists of strong, flexible fibers and is infamous for its heat retardant ability. It is because of these characteristics that it has been sought after since the time of ancient Rome and can be used for a variety of products. It has been difficult for researchers to assign it a specific definition due to the fact that its meaning varies with the source and purpose of certain asbestos (Mineralogy and Morphology of Amphiboles, 2006). For asbestos is merely a commercial name given to a cluster of similar fibrous minerals (Bateman, 1951).

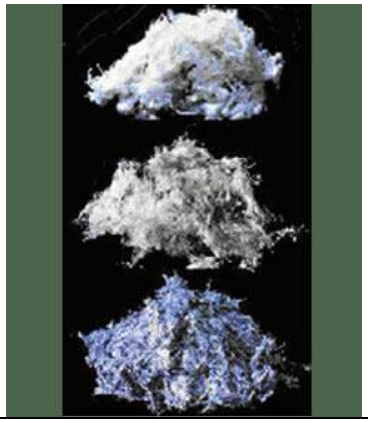

Figure 1: top: Chrysotile, middle: Amosite, bottom: Crocidolite. http://www.enviraz.co.uk/about_asbestos.htm

There are two groups of asbestos: chrysotile and amphibole. Chrysotile, also known as serpentine asbestos, is the main asbestos mineral. Every nineteen out of twenty asbestos products contain chrysotile. It is the most fibrous type of asbestos and it can take an eternity to completely separate one piece. It has the best resistance to heat yet the worst to acids and alkalizes. Canada, mainly Quebec, contains the best deposits of chrysotile asbestos in ultrabasic rock made up of peridotite. The amphibole group consists of 5 minerals: amosite, anthophyllite, tremolite, actinolite, and crocidolite. Amosite, which is only extracted in Africa, has long, strong fibers, good flexibility, and shows good opposition to acids and alkalizes. It is typically used as insulating material. Anthophyllite, tremolite, and actinolite contain weak, brittle fibers limiting their value. The mineral crocidolite, however, has strong fibers, shows good resistance to alkalizes and acids but poor resistance to heat. That makes this mineral great for fabric used in acid-resistant packaging. In the amphibole group, deposits of amosite and crocidolite compose the rest of the world's production of asbestos not accounted for by chrysotile (Lamey, 1966).

Similar to talc, there are many questions pertaining to the formation of asbestos. Most investigators agree that asbestos comes from alterations in ultramafic rocks. But science has to continue its progress in further unraveling the mysterious history of such a valuable mineral.

People living in areas with technology have heard of the health risks and problems associated with asbestos. There are constant television service announcements circulating throughout the United States about compensation for workers in asbestos-filled hazardous jobs who have developed mesothelioma. From the 1800s to around the 1970s, asbestos was placed in all offices, homes, and schools. It was even a federal law to use it as insulation and roofing material in commercial buildings because of its capability to resist flames. Then during the 1980s the harmful effects of asbestos exposure became known to the public and

the government amended the law. Asbestos has been left in older buildings since studies show that the asbestos is not harmful unless pieces of fibers flake off and become air-borne. Then those infinitesimal flecks can travel through the air and infect occupants of the building by lining the respiratory cavity. There are strict governmental regulations on buildings containing asbestos and these buildings must be inspected periodically to keep the asbestos intact.

The respiratory diseases associated with this mineral are asbestosis, malignant mesothelioma, and lung cancer. Asbestosis is a chronic lung disease caused by the inhalation of asbestos fibers. The fibers aggravate the lungs which lead to scarring. Scars make it difficult for the blood to get oxygen. Mesothelioma is a rare cancer that can occur in the lining of sections of the torso as well as the organs within the chest. It can take years after exposure to asbestos for it to develop. There has recently been an outbreak of it in retirees of mines and industries because they worked among asbestos for years before it was recognized as hazardous. Lung cancer is the most fatal in relation to asbestos exposure ("Basic information asbestos", 2010). Those that worked in mines, mills, or industries dealing with asbestos and happen to be regular smokers would have a much higher chance of developing it.

There is a common rumor that commercial talc contains asbestos fibers. It became so extreme at one point that many households stopped buying talc products and threw out any they might have possessed. The truth is that the majority of talc is free of asbestos. The small percentage that does contain asbestiform fibers is not mined for industrial or domestic use; they are usually taken for scientific study. These are mainly found in the eastern United States (Ross, 2004). Samples were collected from the Day

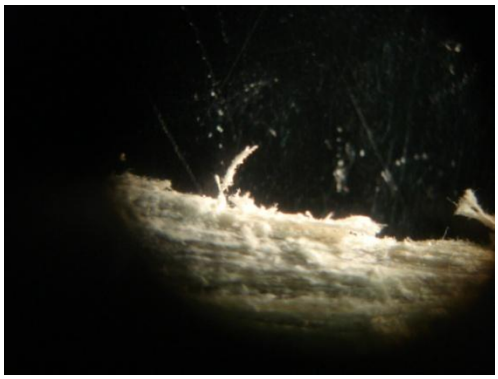

Figure 2: A sample of asbestos. Image taken 7-13-10

Book Dunite Quarry in North Carolina. In Figure 2, a strand of asbestos was observed under a microscope. It is easier to see the individual fibers that compose it. When inspected closer, asbestos greatly resembles cotton fibers.

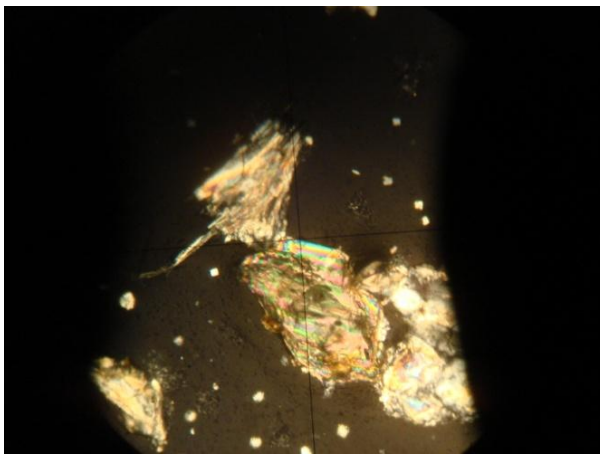

Figure 3: A sample of asbestos and talc taken from Day Book Dunite in North Carolina. Image taken on 7-14-2010.

Another sample taken from Day Book Dunite was at first glance considered talc. It looked like talc and felt like it. But under further examination with a polarizing petrographic microscope, the investigator discovered that the rock seemed to be almost half talc and half asbestos. There were asbestiform fibers scattered throughout the slide. In Figure 2, the asbestos fiber is located near the top and the talc is attached to its bottom right. To confirm that those are in fact two different substances, their interference colors were examined. Every mineral has its own interference colors. Figure 4 provides a better view of the differences between the talc and asbestos. Notice their spectrum of colors. The asbestos on the left has thin strands of mostly blues and greens. The talc on the right, however, has plates of colors and each plate has an outline of violet. Those dissimilar patterns prove that asbestos does occur naturally in talc.

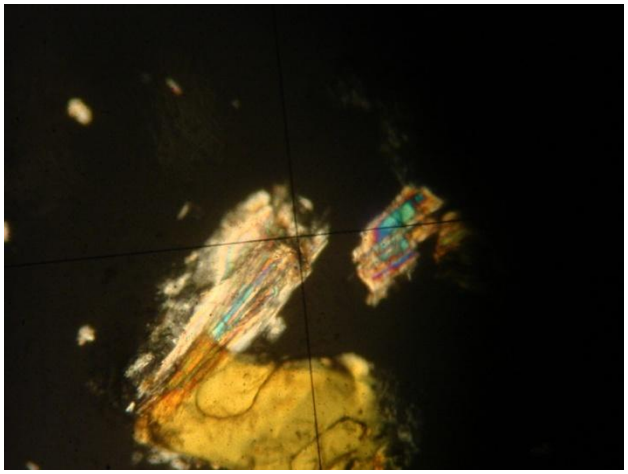

Figure 4: A sample of asbestos and talc taken from Day Book Dunite in North Carolina. Image taken on 7-14-2010.

In conclusion, asbestos is present in some talc but not all. Even so, this combination of minerals is only located in the eastern United States where talc is no longer mined. This means baby powder, cosmetics, and paper are free of any asbestos and are completely safe for use. The portion of the public that lived through the talcum powder scare several years ago now know for certain that their health is not in jeopardy.

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