



Original Research Article

Discovering of Asbestos Fibers and Corn Starch in Talc Material for Baby Powder Samples from Different Markets in Benghazi City

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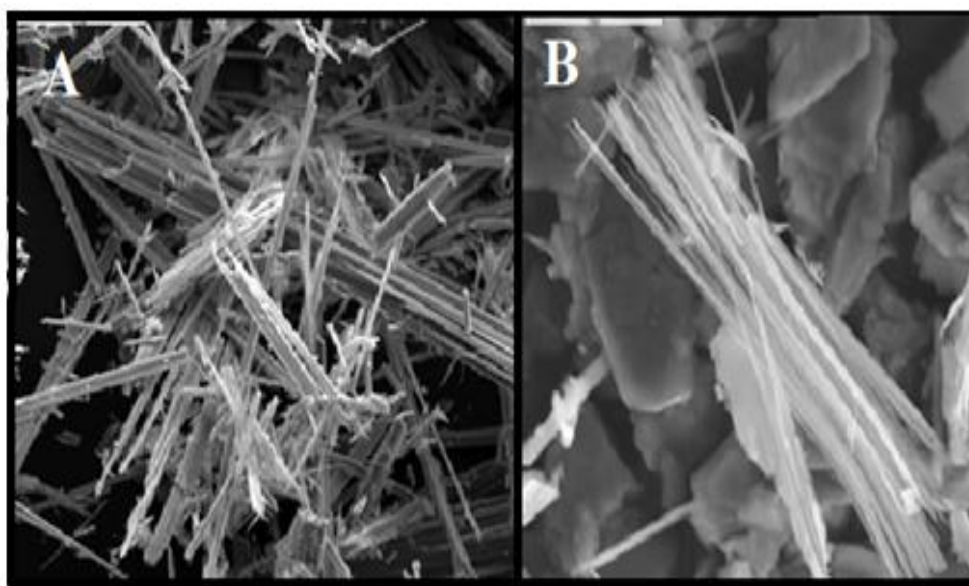
Talcum

Corn starch

ABSTRACT

This work gives mastery over the asbestos fibers that found their way to talc material in baby powder. There are two kinds of baby powder made up of (i) Baby powder is based on talc material with components and (ii) Baby powder based on corn starch with talcum. The new research points to the connection between asbestos molecules and several types of cancers. Asbestos is a natural appearance and it was used as thermal insulating material in factories and has been elicited for its risks on the workingman. The widest method to detect asbestos fibers is microscopes and the SEM was used in this study to detect asbestos fibers in different products from local markets further more iodine test to discover if the product has starch. In this work, sex of twelve samples of baby powder may contain asbestos fibers and two contain starch.

GRAPHICAL ABSTRACT



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1. Introduction

1.1. Talc material

Talcum mineral is widely used in several fields of industrial purposes because of the flexibility of their structure from tri-magnesium tetra-silicate di- hydrated complex $[\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2]$ [1]. This unique structure with tetrahedral of SiO_2 layers make the talcum soft and break off simply. Talcum stone can be used in paper manufacturing, as a thickening agent in paints and ceramics ware; also it is used in face products and cosmetics to keep the body dry and fresh. People commonly used powders to protect, dry, and perfume their skin, and the talc material is the most used for its softness and ability to absorb moisture and provide lubrication at the same time. This material is naturally occurrence and safely used for hundreds of years. [Figure 1](#) displays the providential natural structure of talc material [2].



Fig 1. The nature rocky structure of talcum

1.2. Fibers of Asbestos

Recently asbestos was registered as carcinogenic and elicited, before that asbestos was used for wide applications in industries such as; insulation stuff, flooring, brake packs, and millboard. It is characterized as a high thermal resister and flexible. Unique properties made asbestos a perfect choice for these

purposes [3]. Three kinds of Asbestos minerals, anthophyllite, tremolite, and chrysotile can contaminate the talcum powder. These minerals have an inorganic structure of tri-magnesium di-silicon tetra-hydrated complex $[\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4]$ [4].

1.3. Toxicity of asbestos

Contacting directly of individuals who work in drilling and industries with airborne asbestos were the most affected with asbestos fiber dangerous. Because of the continuous daily breathing and exposure to airborne asbestos fiber that can lead to many kinds of deadly diseases for different types of body parts that may get hurt [5]. Asbestosis, caused by the breathing of asbestos, leads to difficult breathing that worsens over time due to a decrease in diffusing ability in the lungs. This disease commonly affects the lower region of the lungs and can only be diagnosed by evaluating the lung tissue using critical light microscopy. [6]. Lung cancer is another disease that attached damage to the Respiratory system specifically in the lungs, smoking people have a more probability of injury to this type of cancer more than another one. The major of death from lung cancer is accountable with patients who are directed contact with asbestos [7]. In 2009, results from an investigation study found an increased rate of another kind of cancer that may cause because of asbestos exposure. This kind is bile duct cancer was spread among patients who had continuously attached job-related exposure to asbestos. Bile ducts link the gallbladder gland to the liver and duodenum. That provides enzymes for digestion. Asbestos fibers can become locked in these small tubules. [8]

Ovarian cancer is another kind of cancer that asbestos fiber may cause and happened in 2009. Scientists established the relationship between asbestos fiber contact and ovarian cancer. Asbestos fibers may travel in the blood

circulation, lymph system, or reproductive system. A clinical Research Study recorded in 2021 that a lot of people with job-related to the mineral of asbestos fiber exposure ensure have a tow-quarter double raising possibility to dangerous of death with ovarian cancer on usual. Other cancers maybe supplementary with asbestos fiber contact take including kidney cancer, throat cancer, gallbladder cancer, and esophageal cancer. Studies on the connection between asbestos and these malicious growths are unpredictable. There are suspicions linking asbestos to these dangerous deadly diseases, but the truly connect is not detected yet [9].

1.4. Talc polluted with asbestos fiber

Pollution of talc with asbestos begins with the taking out of the mineral from the earth's

surface. This process must be taken carefully enough because of the high probability of asbestos minerals being pulled out and polluting the raw product. At progressing, the pressure and thermal factors talcum such as the many rocks that contain the minerals will be found with asbestos within mistake lines and with the presence of CO₂, circuitous transformations into talc and magnetite may occur [10]. Furthermore, talcum tends to break down into several compounds and be unstable at this point. Figure 2 depicts that when talc reaches a temperature of approximately 700 °C and a pressure of 2 Kilos bars tend to break down and polluted with asbestos minerals [11]. Therefore, talcum powder as well as talc-containing products should be tested for potential asbestos pollution before going through the marketing process.

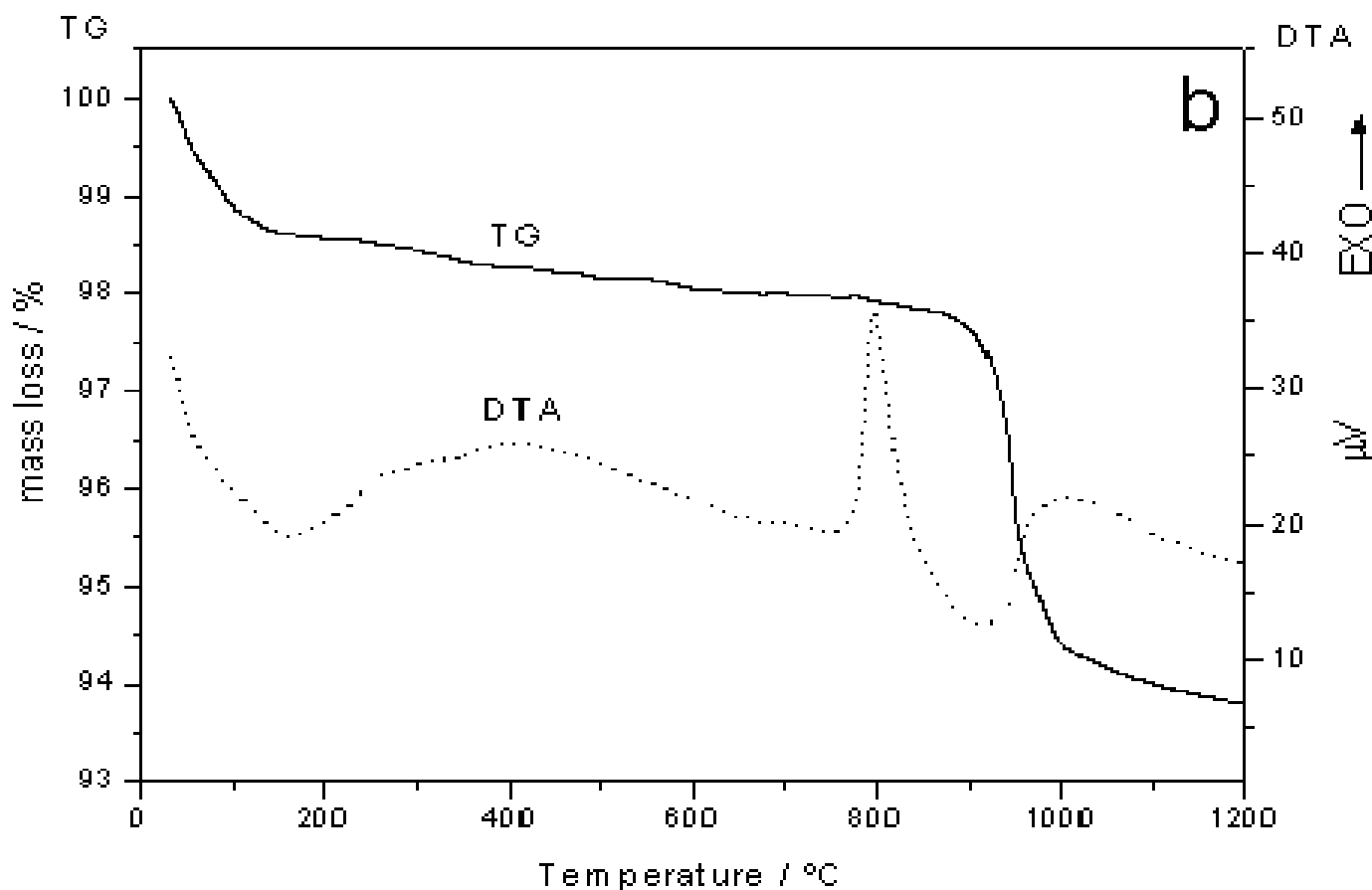


Fig 2. Thermal-pressure graph shows Talcum when begins to break down

1.5. Instruments used for recognized asbestos fiber in talcum products

In 1973, the first technique was produced to test talcum containing products with a polarized light microscope (PLM) that is including the mixing of the talcum samples with liquids with refractive properties, after that the samples were observed under polarized light microscopy, and counting the fibers numbers that reached to over 10,000 particles estimated. This procedure was time and effort-consuming. Many instrumental methods are used in the testing of talc-containing products for asbestos and other potential impurities. After that A.M. Blount proposed a procedure using a micro centrifuge to isolate the asbestos minerals and talcum by the weight, and then viewing the asbestos fibers using PLM to get a more accurate counting in a shorter time [12]. Electron microscopy is another kind of microscopy that can be used for this type of analysis procedure. It is separated into two major types of familiar microscopy, Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM).

According to Skoog *et al.*, SEM images the external morphology of the specimen whereas TEM images the internal structure which is the basic difference between these techniques [13].

1.6. Starches in baby powder

Talcum powder has been established as a harmful character in recent times, with various research appealing that talc can cause different kinds of cancers for internal body organs when used for a long sequence time. At present, there is a panel of judges who have been definite there were enough marks to advise that talcum was the main reason for evolving cancer in three women [14] so that the community has been finding out other materials substituted talc and consider safe to use. Individuals even though similar look like to form of talc, corn starch is

synthetic of bigger constituent part and made from corn. It is a widespread component of various kinds of foods and has been founded in sweetmeats, soups, and sauces [15].

1.6.1. What is the difference between Talcum Powder and Cornstarch?

The comparison between talcum powder and starch may take from different faces. In the beginning, talcum powder is formed from a rock kind of several minerals whereas corn starch is prepared from a diet ingredient. Corn starch has a bigger constituent part, so it has been considered to be a safer form of baby powder compared to talc [16]. However, cornstarch could still cause respiratory problems if inhaled in large quantities. Studies suggest that when talcum powder is used in the perinatal area, the talc particles can travel through the womb, up the fallopian tubes, and into the ovaries [17]. Because of the inorganic nature of talcum particles the cells of the human body cannot crack up talc particles, they can cause oncogenic cells to grow. Corn starch is observed by researchers as a nontoxic and talcum powder should be escaped [18].

In this work, twenty baby powder samples from different locations were used to discover asbestos fibres and corn starch ingredients in the talc material for twelve baby powder samples from Benghazi markets and pharmacies.

2. Experimental

2.1. Characterization of Asbestos fibres

Scanning Electron Microscopy (SEM, Tescan VEGA2 SB) has been used to identify the morphological features of asbestos fibres. The SEM images can determine the most important two things, such as the shape and size of the particles.

2.2. Characterization of corn starch ingredient

The starch can be detected by a standard method called the "iodine test" where the starch reacted with iodine to form a complex with a blacked blue colour due to the founding of a charge-transfer complex.

If the solution doesn't contain starch the colour of the solution remains yellowed brown [19-20]. 1 g of baby powder sample with starch labelled was suspended in 50 ml of 25% Ethanol and drops of 0.5 M of iodine solution have been added and the change in the colour was recorded [21-23].

3. Results and Discussion

For this research, twelve samples of baby powder have been used most of them have high-end brand names. May la Bebek pudrasi (Turkey), Surprise (Turkey), Johnson's Baby powder blossoms (Indonesia), Nunu baby powder (K.S.A), Enchanteur (Malaysia), Pond's (India), Cussons Baby (England), Beautiful perfumed talc (Libya), Dolin baby powder (Turkey), Johnson's blossoms (Malaysia), and Chicco talcum powder (Italy).

3.1. Scanning electron microscope (SEM)

The images shows that some of the samples contain fibres seem like asbestos material and those fibres similar to SEM standard image of asbestos. [Figure 3 and 4](#) illustrates the images for samples with SEM possible asbestos like minerals have been found in six of the twelve baby powder samples: May la Bebek pudrasi (Turkey), Surprise (Turkey), Johnson's baby powder blossoms (Indonesia), Pond's (India), Cussons baby (England), and Beautiful perfumed talc (Libya). The images were compared to images of standards of asbestos fibre under

microscope. [Figures 5](#) depicts chrysotile (A) and anthophyllite (B). There are the most common two type of asbestos: fibred and rod shaped objects.

3.2. Corn starch test

This test was performed to evidence starch appearance in baby powder samples; the result was three of twelve samples contain starch by converting the colour of the solution to dark blue when the iodine solution was added. Appearance of the starch may improve the quality of the baby powder and we recommend using these products. The samples that contain starch are Chicco Talcum powder (Italy), Nunu baby powder (K.S.A), and Enchanteur (Malaysia). [Figure 5](#) demonstrates the starch test on baby powder samples.

4. Conclusion

Talcum powder enjoys wide popularity among the public, as it is not limited to children's use only, but also used by adults, women, and men, as well as the elderly, there are also many products from different sources filling the market. Therefore, it was necessary to verify its effectiveness, as well as with the wide spread of cancer diseases recently. Studies have proven that asbestos fibres infiltrated it, especially with use directly and daily with talc products, where these fibres can block and accumulate within the cells, causing many serious diseases. Through this study, we recommend using starch-containing products as an alternative or addition to talc because it is safer and less harmful to the cells. X-ray diffractions are required to determine the character of suspected asbestos fibres.

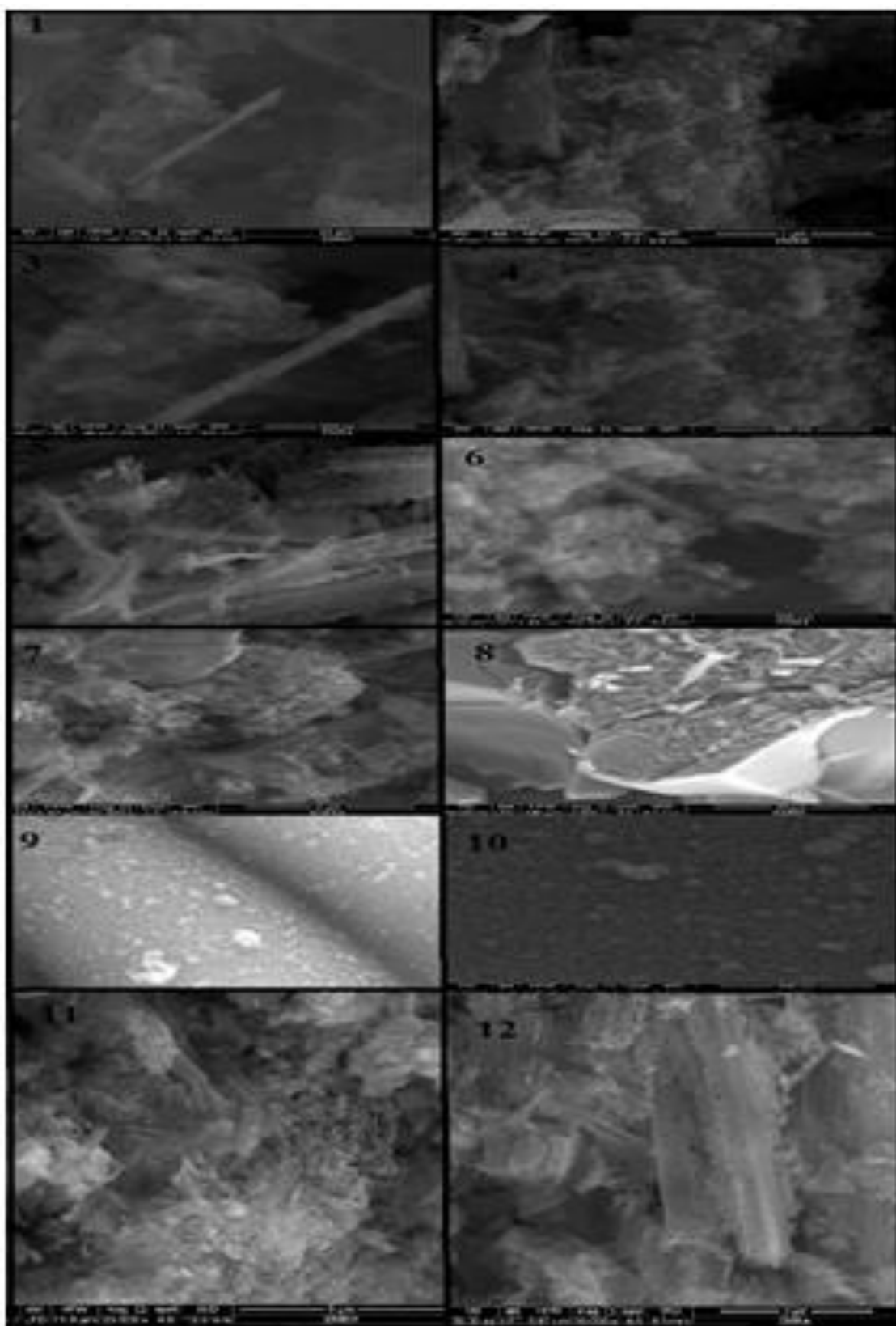


Fig 3.SEM images obtained from baby powder samples

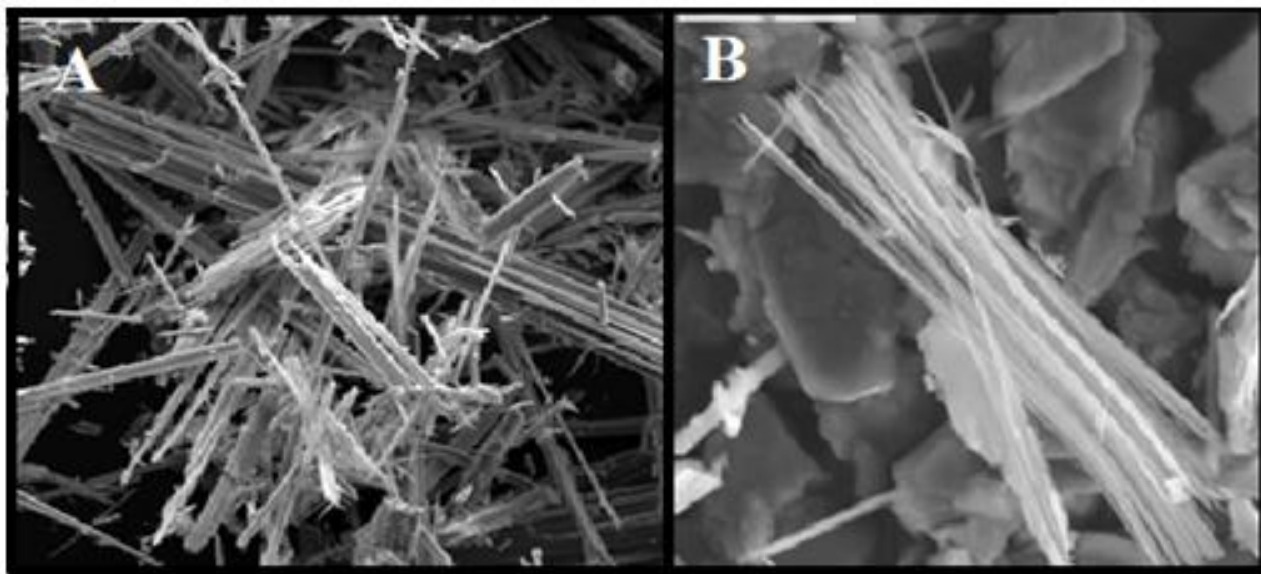


Fig 4.Images of (A) chrysotile asbestos and (B) anthophyllite asbestos standard



Fig 5.Starch test on baby powder samples

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