All about Natural Rubber - Properties, Applications and Uses

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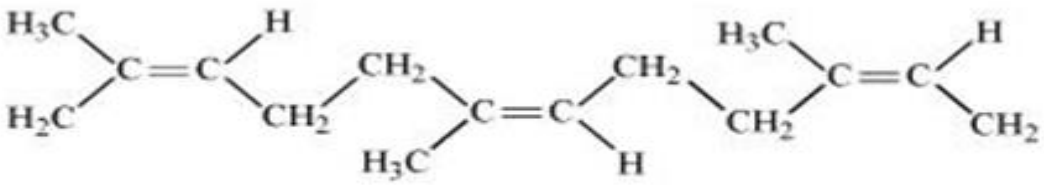
Abstract: Rubber is an elastic made from the exudations (oozing out) of certain tropical plants or petroleum and natural gas. Rubber is the primary component of tires used in automobiles, aeroplanes, and bicycles because of its flexibility, durability, and hardness. More than half of all rubber produced is used in automotive tires, with the remainder going into mechanical parts like mountings, gaskets, belts, and hoses, as well as consumer goods like shoes, clothes, furniture, and toys. **Elastomers**, or "elastic polymers," are the major chemical ingredients of rubber. Elastomers are long chainlike molecules that can be stretched to vast distances and still return to their original shape.

Keywords: Natural Rubber, Status, India, Productivity.

Introduction

There are many rubber products which we come across in our daily life. Some common rubber-based objects that we encounter in our day-to-day lives include rubber gloves, rubber bands, and rubber footwear. Rubber items have the ability to recover their shapes after being stretched or distorted, which is the reason why rubber can be classified as an elastomer. Rubber is an elastic substance which can be obtained both naturally (natural rubber) or artificially (they can also be synthesized chemically in laboratories; synthetic rubber-like butyl rubber, neoprene, etc.).



Natural rubber

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Natural Rubber Properties

Natural rubber has flexibility and strength, as well as impurities and vulnerability to environmental conditions and hydrocarbons. Compared to other rubbers, natural rubber is one of the most flexible types, and it's resistant to water and certain chemicals. It's also resistant to cutting, tearing, wear, fatigue, and abrasion, with a working range between -58 to 212 degrees F. Additionally, it has a lot of tensile strength and adheres easily to other materials.

However, natural rubber isn't as effective at resisting heat, light and ozone as other rubbers like neoprene. The material also varies with the tree it's produced from, as well as containing natural impurities. While natural rubber is resistant to water and some chemicals, it's still vulnerable to fuel, oil, and non-polar solvents.

Types of rubber

Each type of rubber material, whether natural or synthetic, has unique qualities that make it suited for specific uses. The following are some of the most prevalent types of rubber based on their origin:

1. **Natural Rubber:** A rubber that is naturally formed by plants is known as natural rubber. It is created from the sap of the rubber trees.
2. **Synthetic Rubber:** It is an artificial or man-made rubber. The commonly found **synthetic rubber** includes isoprene rubber, butyl rubber, silicon rubber, etc.

Natural rubber

Natural rubber is a polymer that is made from plants. A big molecule comprises numerous smaller molecules of the same kind. Some polymers are created in labs and factories, while others are found in nature. A polymer is a chemical substance composed of numerous tiny molecules of the same kind. Some polymers are created in labs and factories, while others are found in nature.

One of the most significant polymers for human society is natural rubber. Natural rubber is an important raw resource that is used to make over 40,000 different goods. It's found in medical gadgets, surgical gloves, plane and vehicle tires, pacifiers, clothing, and toys, among other things. Natural rubber is made from latex, which is a yellowish milky fluid made up of proteins, **carbohydrates**, alkaloids, and other substances generated by a variety of plants. It also contains rubber in some plants, which is a milky liquid found in latex vessels (ducts) or rubber-producing plant cells. Only 2,500 types of plants have been identified to contain rubber in their latex, despite the fact that around 20,000 species of plants generate latex.

Natural rubber has been utilized in engineering for many years for one simple reason: it can withstand a lot of pressure while still performing critical duties.

How is Natural Rubber Made?

Natural rubber is created from the sap of rubber trees as a starting ingredient. Rubber latex is collected by tapping the rubber plants.

- An incision is cut into the rubber tree's bark for this, and the latex sap is collected in cups.
- The raw natural rubber is refined once the latex sap is collected to make it useful rubber.
- Originally, acid was added to the latex, causing the sap to harden like jelly. The latex jelly was then flattened and rolled into rubber sheets, which were then hung to dry.

Charles Goodyear developed a more complex method of making rubber stronger and more elastic in 1839. This was the vulcanization of rubber.

Natural rubber that has not been processed is sticky, deforms readily when heated, and is brittle when cold. It cannot be utilized to manufacture items with a high amount of elasticity in this state. The polymer chains are vulcanized, which inhibits them from moving independently. As a result, when vulcanized rubber is stressed, it deforms, but when the tension is released, the product returns to its original shape.

Source of Natural Rubber

Hundreds of different plant species are used to make natural rubber. The most important source, however, is a tropical tree endemic to the tropical Americas called Hevea brasiliensis. This tree thrives in climates with an annual rainfall of less than 2000 mm and temperatures ranging from 21 to 28 degrees. The optimal growth region is roughly 10 degrees on each side of the equator due to these characteristics and the tree's preferred height of around 600 meters. It is, however, grown further north in China, Mexico, and Guatemala.

How Do You Make Natural Rubber?

Natural rubber must first be tapped from a rubber tree, then processed with chemicals and heat to be used in manufacturing. The tree is cut and the sap drips into a cup. A third of the latex is rubber at this point, held in a colloidal suspension, and another third is water. To refine the latex into rubber, latex is mixed with formic acid to make it the rubber coagulate into curds, which are then washed and pressed into blocks or pressed into sheets that are then smoked.

Next the rubber is put through masticating machinery to make it more workable, then mixed with chemicals to improve its properties. Finally it’s made into a form, either by calendaring or extrusion, then vulcanized, which makes it more durable, elastic, and resilient. Vulcanization involves heating the rubber with some sulfur in a pressure cooker at around 320 degrees F, although it can also be steam cured, microwaved, or sent through a fluidized bed or molten metal salts to be vulcanized. The vulcanization cross-links molecular chains of

polyisoprene to add strength and chemical resistance, and remove the stickiness of raw rubber. Even though artificial rubber was invented in the 1930s, natural rubber is still widely used today, making up a little under half the market.

What is Natural Rubber Used for?

Natural rubber is used in applications requiring a high level of wear and heat resistance. Thanks to its strength and compressibility, natural rubber is used in engineering applications, like anti-vibration mounts, drive couplings, springs, bearings, rubber bands, and adhesives. But the majority- 50% of natural rubber- is used in high-performance tires for race cars, buses, and aircraft thanks to its strength and heat resistance. It's also used in hoses, automotive parts, foam mattresses, and battery boxes.

However, thanks to its adhesive properties, natural rubber is also found in rubber cement and the soil stabilization materials used around new roads. Even raw rubber is sometimes used for adhesives and as part of shoe soles. Additionally, about 10% of latex harvested from trees is simply reduced down to 60% rubber solution to make products like latex gloves or to use as a coating.

Properties of Natural Rubber

Some of the unique properties of natural rubber are as follows:

- Natural rubber combines strong tensile and tears strength with excellent fatigue resistance.
- It has great green strength and tack, which means it can attach to itself as well as other materials, making fabrication easier.
- One of its disadvantages is that it has a modest resistance to environmental degradation caused by heat, light, and ozone.
- Natural rubber adheres well to a brass-plated steel cable, making it perfect for use in rubber tires.
- It has a low hysteresis, which means it generates less heat, preserving new tire service integrity and extending retreadability.
- Natural rubber has a low rolling resistance and improves fuel efficiency.
- Cutting, chipping, and tearing resistance is excellent.

Uses of Natural Rubber

Some of the uses of natural rubber are as given below:

- Natural rubber is a good water repellent.
- This may be the most effective defence against infections like the AIDS virus (HIV). Latex is utilized in condoms, surgical and medical examination gloves for this reason.
- Natural rubber is a great material for springs.
- Catheters, balloons, medical tubes, elastic thread, and various adhesives all include natural rubber latex.
- It is the only raw material utilized by the car industry, other than rayon.
- Rubberwood is a byproduct of natural rubber that is becoming increasingly important. It serves as a supply of charcoal for the local community's cooking.

Things to remember

- Rubber is a natural product made by plants that may be found in many of the items we use on a daily basis.
- Natural rubber is an elastic material made from the latex sap of trees, particularly those belonging to the Hevea and Ficus species.
- More than half of all rubber produced is used in automotive tires, with the remainder going into mechanical parts like mountings, gaskets, belts, and hoses, as well as consumer goods like shoes, clothes, furniture, and toys.
- Rubber's properties include tremendous strength and the ability to stretch repeatedly without breaking.

- Natural rubber compositions are extremely flexible, have excellent electrical insulating properties, and are resistant to a wide range of corrosive chemicals.

Conclusion

This guide has summarized the definition, properties, manufacturing process, and applications of natural rubber. We hope this information helps you with your supplier search. For more information on the various types of rubber, you can read through our rubber guide. If you're more interested in finding suppliers, we invite you to check out Thomasnet, where we have profiles on more than 70 natural rubber suppliers.

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