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# BASALT FIBER TECHNOLOGY AND PRODUCTS

***Abstract**: basalt continuous fiber is a unique product of the XXI century. Today, the range of goods and products based on basalt fiber which differ by their strength and heat resistance, is wider. They can be used as fire-fighting agents in automobile construction, energetic, chemical and petrochemical industry, metallurgy, agriculture, hydro technical construction, port facilities, marine platforms, high-rise buildings and important industrial facilities, bridges, tunnel embankments, railways. In general, basalt ore can be used not only as a fiber, but also in various types of composite materials.*

***Keywords**: basalt fiber, properties, green material, composites, application, manufacturing.*

Basalt is an aphanite (small-grained) rock that contains 72% plagioclase, 20% pyroxene, 3% chlorite, 4% ore mineral, 0.5% olivine and other minerals. To obtain a continuous basalt fiber, it is necessary to process it at a high temperature. The initial melting temperature ranges from 230-250 ℃ temperature to 1145 ℃ temperature. There are several open mines of Gabbro-basalt rocks with high chemical stability in Turkmenistan. Their total reserve is more than 250 million tons. Today, the basalts of the "Shagadam" differ by their quality. From the basalt obtained there, it is possible to prepare "Basalt fiber" and show high results.

Basalt is an environment – friendly natural material. Basalt is used for basalt fibers (BFs) production. BF was one type of high-performance inorganic fiber which were made from natural basalt. BF is known as a green industrial material. BF is colloquially known as the “twenty-first-century nonpolluting green material”. Safe and abundant, basalt rock has long been known for its thermal properties, strength, and durability. BFs are environmentally friendly as recycling is much more efficient than

glass fibers. Growing environmental awareness throughout the world has triggered a paradigm shift towards designing materials compatible with the environment. BF can be classified as a sustainable material because BFs are made of natural material and during its production, no chemical additives as well as any solvents, pigments, or other hazardous materials are added. When the BFs in resin are recycled the same material is obtained again as natural basalt powder as its melting point is quite high i.e. 1400° C, this means that composite containing basalt is incinerated, the only product left in an un-molten basalt that can be used again. BFs are 100% natural and inert. Basalt products have no toxic reaction with air or water and are non-combustible and explosion-proof. When in contact with other chemicals they produce no chemical reactions that may damage health or the environment. They have been tested and proven to be non-carcinogenic and non-toxic.

Useful of basalt fiber:

1. Excellent mechanical properties: basalt fiber has excellent tensile strength and modulus of elasticity, and can be widely applied to reinforced composites.

2. High corrosion resistance and chemical stability: basalt fibers have unique chemical stability in extreme conditions, it can be used in many concrete structures, such as bridges, tunnels, dams, floors, and other concrete structures, such as asphalt concrete pavement, aircraft landing runway, etc., which are often affected by high humidity, acid, alkali, and salt medium. The application in the structure has opened up a broad prospect.

3. Basalt fiber has higher electrical insulation than glass fiber. It can be used as a heat-resistant insulating material in the field of printed circuit board manufacturing in the electronic industry. The permeability of the electromagnetic wave is excellent, if a basalt fiber cloth is added to the wall of the building, it can produce good shielding for all kinds of electromagnetic waves.

4. High thermal stability and high acoustic and thermal insulation properties: basalt fiber is widely used in adiabatic insulation because of its low thermal conductivity, large working range and good seismic performance. In addition, basalt fiber has porous structure and irregular arrangement mode, and has good sound

absorption property, so it can be used as acoustic insulation material for production equipment.

5. Good compatibility with metal, plastic, carbon fiber and other materials: the composite of basalt continuous fiber and various kinds of resin has stronger bonding strength than glass fiber and carbon fiber. The composites made of continuous basalt fiber are equivalent to E-glass fiber in strength, but elastic modulus has obvious advantages in all kinds of fibers. If a certain amount of carbon fiber is added to the basalt fiber and interwoven with two different fibers, the modulus of elasticity, tensile strength and other properties of the composites will be greatly improved. Compared with the pure carbon fiber composites, the cost will be greatly reduced.

In many ways, Basalt fiber production is similar to glass fiber production. The process of Manufacturing of Basalt filament consists of four major steps, Melt preparation, Extrusion, Fiber forming, use of lubricants and finally winding.

In generally, this project will help to transform the properties of this mineral into an innovative resource which contains several compounds and properties.

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