

ECO COMPOSITE MATERIALS USING BASALT ROCKS

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Abstract: this article discusses the properties of eco-composite materials using basalt rocks. Taking the material of the matrix and filling components, professionals create unique compositions that can cater to certain, often specific requirements of a particular application. And the properties that each of the components of the composite gives are crucial for the characteristics of the final product. Compared to other composite materials, basalt is a more environmentally friendly product. The properties of natural basalt make it a good building material.

Keywords: basalt, environmental friendliness, eco material, composite materials.

ЭКОКОМПОЗИЦИОННЫЕ МАТЕРИАЛЫ С ИСПОЛЬЗОВАНИЕМ БАЗАЛЬТОВЫХ ПОРОД

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Аннотация: данная статья рассматривается свойства экокомпозитных материалов с применением базальтовых пород. Используя материал матричного и наполняющего компонентов, профессионалы создают уникальные композиции, способные угодить определённым, зачастую специфическим, требованиям конкретного применения. И свойства, которые даёт каждое из составляющих композита, имеют решающее значение для характеристик конечного продукта. Базальт является по сравнению с другими композитными материалами более экологичным продуктом. Свойства натурального базальта делают его хорошим строительным материалом.

Ключевые слова: базальт, экологичность, экоматериал, композитные материалы.

Introduction. The article provides information on the characteristics and main advantages of continuous basalt fibers. Basalt fiber combines a number of unique properties and an attractive production price, which makes it a competitor not only for traditional structural materials. The advantages of this material are in a significant raw material base, namely the prevalence of basalt eco-friendly igneous rock around the world. This material has resistance to high temperatures, chemical resistance, durability, hygroscopicity, complete environmental friendliness and low price in comparison with the nearest competitors.



Fig. 1. Garden furniture based on basalt fiber by Latvian designer Raimonds Cirulis

Main part. Basalt is the earliest, widespread and environmentally friendly product. At its core, this is magma, which has poured out in molten form from the vents of volcanoes. Having entered into interaction with the atmosphere, it somewhat changes its properties, spreading in lava flows, and gradually cools down. There are basalt deposits in almost all countries, their reserves are huge. The first basalt fiber was obtained quite a long time ago.

Along with the environmentally responsible mining and manufacturing process, they have unique physical properties that have been noticed and appreciated by various industries. Currently, they are used in the production of interiors and structural parts, sports equipment, consumer goods, furniture, packaging.

Today, almost none of the reputable international exhibitions takes place without the presence of solutions for basalt composites: Techtextil, JEC World, Composite Expo, CAMX, ACCE. Exhibitors demonstrate equipment for the manufacture of basalt composites, basalt fiber and fiber, finished products and solutions for automating the design and production of composites based on basalt fiber [1].

Basalt fibers have high heat resistance, which opens up wide prospects for use in conditions of critically high temperatures and is successfully used by various manufacturers.



Fig. 2. A concrete pier reinforced with basalt fiber from the Swedish company SF Pontona

The resistance to aggressive environments of basalt, with growing large-scale projects in the field of wind energy, makes designers turn to basalt fiber as a component of durable structures with increased requirements for the strength of materials.

The Aachen University Institute of Technology (ITA) project to reinforce concrete with basalt fiber BasFlair has become part of the German climate initiative. The authors of the project replaced the more expensive and energy-intensive carbon fiber with basalt fiber in textile concrete, an alternative to conventional concrete that has been developed in Aachen since the 1990s. The introduction of carbon fiber and glass fiber into the concrete solution increases the tensile strength of brittle concrete like steel reinforcement. However, due to the fact that the fiber for textile concrete is 75% thinner, the finished structure has less weight with the same strength as a metal-reinforced one and, accordingly, transportation costs and production carbon dioxide emissions are reduced [2].



Fig. 3. Concrete "flower" of the Bas Flair project

Basalt composites are a universal material that finds application in segments that are far from heavy industry, but play an important role in human life. The American prosthetic and orthopedic company CoyoteDesign uses basalt tissue as the main reinforcing material in the manufacture of prostheses. CoyoteDesign has developed their own basalt composite called CoyoteComposite. It works great with common resins used in prosthetic sleeves, but fills much better than carbon. It has more flexibility and resilience, does not cause such skin irritation as carbon fiber, and is much cheaper. From CoyoteComposite, the company manufactures braided tape, fabric and rope, all of which are used to reinforce various parts of products.



Fig. 4. Basalt Fiber Tape from Coyote Composite

Conclusion. The main task was to consider the current state of basalt fibers and their use as a reinforcing phase in composite materials. Based on existing studies, it follows that basalt fibers compare favorably in the combination of the following characteristics: radio transparency, which expands the range of material applications; high strength; work in a wide temperature range; resistance to acids and alkalis surpassing analogues. Also, basalt fiber is characterized by more environmentally friendly and economical production. The advantage for the development of fiber based on basalt raw materials is a large base of igneous rock deposits around the world.

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