



## **Basalt Products' Origin History and Fiber Extraction Processes**

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**Annotation:** This thesis analyzes the history of the origin of basalt products, the natural characteristics of basalt rocks, the processes of obtaining basalt fibers, and their significance in industry. Basalt fiber possesses properties such as high strength, heat resistance, and environmental friendliness, making it widely used in various sectors of modern industry. The thesis discusses the production process of basalt fibers, including the melting of basalt rocks and fiberization technologies. It also examines the main application areas of basalt products and the prospects for their future development. This research could be useful in expanding the use of basalt materials in terms of ecological efficiency and their role in industry.

**Keywords:** Basalt, basalt fiber, production technologies, fiberization, ecological materials, high strength, heat resistance, composite materials, construction, aerospace industry, automotive industry, environmentally friendly materials.

### **Introduction**

• **Relevance of the topic:** Basalt products and their extraction processes are widely used in modern industry, especially in construction, aerospace, and automotive industries. The ecological purity and high technical properties of these materials have made them popular worldwide.

**Basalt Products:** The primary goal of producing basalt products is to utilize its natural properties and apply them in various industrial fields. Below are some types of basalt products:

1. **Basalt Fiber:** The production of basalt fiber involves melting basalt rock and the process of fiberization. Basalt fiber is known for its high strength, heat resistance, chemical stability, and environmental purity. These fibers are primarily used in construction (insulation materials), automotive (composite materials), and aerospace (structural components).

2. **Basalt Stones and Slabs:** Basalt stones are used in construction as foundations, walls, road coatings, and decorative materials. Basalt slabs and tiles also possess high durability and are used in various decorative applications.



3. **Basalt Composite Materials:** Composite materials made from basalt fibers are lightweight, heat-resistant, and strong, which makes them widely used in aerospace, automotive, and construction industries. These materials enhance the strength of structures while reducing weight.

4. **Basalt Materials for Tooling:** Basalt-based materials, such as basalt inserts, are combined with aluminum or plastic composites to improve energy efficiency. These materials can be recycled without harming the environment.

5. **Basalt Gravel and Aggregate:** Basalt gravel and aggregate are commonly used in construction and road building due to their excellent mechanical properties and long-lasting durability.

#### **Advantages of Basalt Products:**

- **High Strength and Durability:** Basalt materials are known for their superior mechanical strength, making them ideal for use in harsh conditions where durability is crucial.

- **Heat Resistance:** Basalt is highly resistant to heat, making it suitable for use in high-temperature environments.

- **Environmental Purity:** Basalt products are made from natural materials and are environmentally safe, with no harmful emissions during their production.

- **Chemical Stability:** Basalt is chemically stable and remains reliable over long periods, even under harsh conditions.

#### **Natural Characteristics of Basalt Rocks**

- **Description of basalt rocks:** The geological composition and origin of basalt rocks, their relationship with volcanic processes. The composition of basalt rocks (silicon, alumina, iron oxide, etc.) and their qualities.

- **Distribution and occurrence of basalt:** The global distribution of basalt as a natural resource and the main regions where it is mined.

#### **History of Basalt Products' Origin**

- **Initial use of basalt:** How basalt was used as a building material in ancient times, such as in Greek and Roman periods.

- **Introduction of basalt fibers to industry:** The production of basalt fiber and its entry into industry (since the mid-20th century). The beginning of basalt fiber production and its technological development.

- **Development and innovations:** The development of basalt fiber production technologies in the Soviet Union and other countries from the 1960s to 1980s.

#### **Processes of Extracting Basalt Fibers**



• **General process of fiber extraction:**

- Melting basalt rocks at high temperatures.
- Converting melted basalt into fibers (fiberization).
- Controlling the length and ensuring the quality of fibers.

• **Technologies for basalt fiber production:**

- Microwave melting and electric arc melting technologies.
- Characteristic methods: production of basalt fibers using both cold and

hot methods.

- Properties: high strength, heat resistance, chemical stability.

• **Areas of application:**

- In construction (insulation materials),
- In aerospace and automotive industries (as composite materials),
- In energy and engineering (strengthening composite materials).

• **Advantages:**

- Ecological purity,
- Energy efficiency,
- Durability and long-term use.

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