



Basalt: An Ancient Material for Innovative and Modern Applications

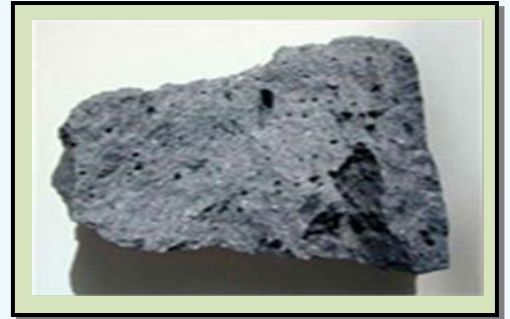


Introduction

Basalt is a dark-colored, fine-grained, very hard igneous rock composed mainly of plagioclase, pyroxene and magnetite minerals, Both of pyroxene and magnetite contain iron and this is the reason why they are black. It most commonly forms as an extrusive rock, such as a lava flow, but can also form in small intrusive

bodies, such as an igneous dike or a thin sill. Basalt

has no harmful properties, any form of it. It is non-explosive and noncombustible.



Chemistry of Basalt

Basalts are composed primarily of magnesium oxide (MgO) and calcium oxide (CaO) and silicon dioxide (SiO₂) with Al₂O₃.

Uses Of Basalt

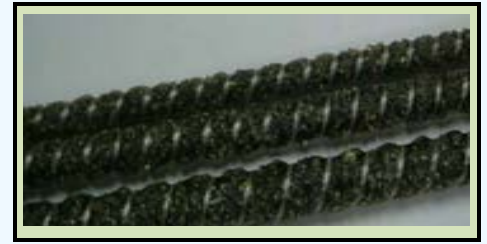
It has several industrial applications, including building materials and thermal insulators. The industrial applications of basalt are based on the basic quality properties of basalt such as high abrasion resistance, compressive strength and chemical resistance.

Basalt can be made into fine, superfine and ultra-fine fibers, basalt fibers are considered superior to other fibers in terms of thermal stability, heat and sound insulation properties, vibration resistance and durability.



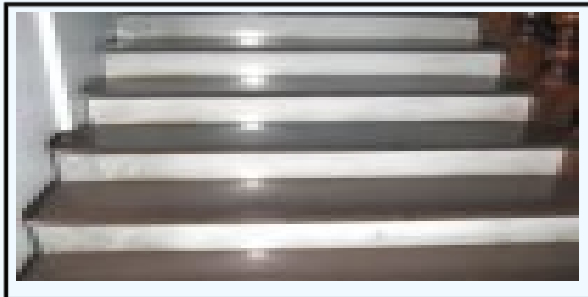
Basalt continuous fibers offer the prospect of a completely new range of composite materials and products, such products have no toxic re-action with air or water, are noncombustible and explosion proof, when in contact with other chemicals they produce no chemical reactions that may damage health or environment.

Basalt based composite can replace steel and all known reinforced plastics (1kg. of basalt reinforcement equal 9.6 kg. steel).



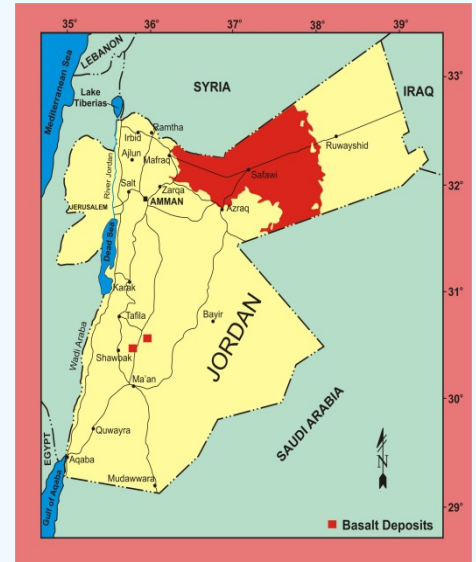
Basalt typical applications: Crushed stone, concrete aggregates, railroad ballast, production of high quality textile fibers, floor tiles, acid – resistance equipment for heavy industrial use, rock wool, basalt plastic pipers, basalt plastic reinforcement bars, basalt fibers, roofing felt, heat insulating basalt fiber materials and glass wool....etc.

Basalt rocks for construction use are divided roughly into two categories: So-called “ornamental rocks”, which are applied with surface polish, as granite and marble; and so-called “semi ornamental rocks”, which are used without polish, as slate.



Basalt in Jordan

Basalt in Jordan is part of the North Arabian Basaltic Plateau and covers an area of about 11,000 km² in the northeast of Jordan and extends northwest into Syria and southeast into Saudi Arabia. Meanwhile, a group of small continental volcanic rocks are present in Central Jordan. Basalt can be used in many industrial applications such as: rock wool, Pipes, molds, and as construction materials.



Geological Setting

They were at least two phases of extensive basaltic activity in central Jordan during Neogene to Quaternary. The oldest basaltic flow crops out north of Al Hashimya where it is partly covered by Pleistocene sediments. The youngest flow covered Wadi gravels north and northwest of Jurf Ed-Darwish village. The basaltic flows form a plateau area and comprise mostly massive and blocky lava in the study area. Volcaniclastic deposits are up to 15 m thick and exposed in the eastern part of Jabal Uneiza area.

Locations

Basalt rocks in Jordan can be roughly divided into three groups: plateau basalts Harrat ash Shaam in north eastern Jordan, basalts relating to the Dead Sea rift, and finally isolated basalt effusions in central Jordan, mostly bound to deep faults. In addition to these areas, basalt are also known in other places in the form of dykes or

sills and other minor bodies, Basalt occurs in different localities in Jordan, but the most important locations are Tell Burma and Jabel Uneiza, about 170km south of Amman in Jurf Ed-Darwish map sheet area.

Reserve

Basalt is spread over an area of about 11,000 km² in the north east of Jordan, which is a very huge reserve. Also, the proven reserves are calculated from data obtained from boreholes drilled in Tell Burma and estimated about 310 Mt.

Mineralogical Properties

X-ray analysis indicates a major content of Augite and Feldspar. Heamatite, calcite and zeolite occur as a minor quantity. The petrographical analysis indicates the presence of following:-

- Olivine: occurs as a major mineral- Feldspar: occurs as plagioclase
- Pyroxene: Occurs as clinopyroxene - Calcite and Zeolite: as a secondary mineral.



Chemical Properties

Oxide	%
Fe ₂ O ₃	13.2 – 14.3
MnO	0.19 – 0.22
TiO ₂	2.80 – 3.30
CaO	9.90 – 11.8
K ₂ O	0.53 – 1.30
SiO ₂	40.0 – 43.0
Na ₂ O	0.62 – 2.50
Al ₂ O ₃	11.8 – 12.7
P ₂ O ₅	0.57 – 0.65
MgO	9.15 – 9.80

Investment Opportunities

Rock Wool Industry

Basalt can be used as an input raw material for the manufacture of rock wool. The latter is sold both domestically and exported and is used mainly in the building for insulation.

Basalt continuous fibers

Basalt fibers are new unique and economic products with superior properties to similar one in present use like as glass fibers.

Areas of Application of Basalt Fiber:

Aviation industry - heat and sound insulation
Automotive - heat and sound insulation of engines, interiors of buses, mufflers, resonators, cameras, industrial construction - internal heat and sound insulation of floors, walls, frame walls,

tubes, pipes, boiler shells, tanks, Energy - nuclear, thermal power stations - reactors, turbines, heating plants, and boilers.

As Aggregates and Building Stones

Jordanian Rock Wool Company used the crushed basalt (25 – 45mm) for rock wool industry, and the size less than 25mm which form 30% of product used as aggregates. The uses of basalt as aggregates is still limited due to the available of alternative and cheap material such as limestone, although the physical engineering properties of basalt are much better than limestone, therefore it consider a good investment opportunity to use basalt in this field, also basalt can be used as a dimension stones for building as well as ornamental stones.

Mould Casting

Currently, there is no investment in this field, but it is a good investment opportunity to use basalt in this industry. Technological tests have been carried out on samples from Tell Burma and Jabel Uneiza south Jordan by Geindustria Co. from Czech Republic in year 2000, the results showed that the basalt of these areas can be used as a mould casting and pipes industries, these results confirmed with the Czech Republic specifications for the same industries.

Note: For More Information and inquiry can be contacted at the following address:

Ministry of Energy and Mineral Resources: memr@memr.gov.jo

Projects Management Unit: E-mail: consultant@memr.gov.jo

Investment and Marketing Div.: E-Mail: Marwan.Madanat@memr.gov.jo