

BASALT MINING IN ICELAND FOR CONTINUOUS FIBER PRODUCTION

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In this abstract, mining and research of basalt for production of structural fibers is explained for the purpose to show the advantages of basalt fibers in structural works. Apart from obtaining materials for civil work, very little mining has been done in Iceland. The only export from Iceland of raw materials is pumice. One factory is in Iceland producing rockwool from Icelandic basalt. Most of the rockwool fabrication is used internally but is also exported to Faroe Islands and Denmark. During the last four-years an intensive research program called GREENBAS has been ongoing ranging from exploration for suitable basalt to evaluating the process line for the making of continuous basalt fibers in Iceland financed by NordMin. Mining of basalt for the production of continuous fibers would constitute a new element in the production of sustainable raw materials for industry. The GREENBAS project aimed at finding a unique material concerning sustainability.

Iceland is located in the North Atlantic Ocean, and represents an island overlying a lower density mantle plume (hotspot) and also lies astride the Mid-Atlantic Ridge where rifting is taking place at a rate of about 2 cm/yr on average. The crust is, therefore, a mixture of an oceanic and a hotspot type. The basalt types range from tholeiitic to alkalic compositions, which are controlled by localized rifting conditions. Although basalt is far the most dominant rock composition, intermediate to acidic rock types are found within central volcanic complexes. The distribution is, however, bimodal with maxima at basalt (90%) and rhyolite (8%) and minima at intermediate compositions (2% andesite). A total of 154 areas in Iceland were explored and sampled followed by chemical analysis and mineralogical studies. The information was then compared to other published studies and communications with contacts in the basalt fiber industry in Russia and USA. The first results seem to indicate that Icelandic basalt sampled contains relatively high iron content which is detrimental in the fiber drawing process. More exploration is needed to locate the appropriate basalt to mine, as well as adapting the process line to the Icelandic rock compositions.

To show the advantages of this new building material, structural research projects were performed on concrete beams, concrete columns and glulam beams, reinforced with basalt fiber rods and basalt mats. Thin concrete panels of 20 mm thickness were also designed and tested. The reinforcement in the panels consisted of a basalt fiber net instead of steel reinforcement. The potential use of the panels is in a façade or in precast concrete elements. The main conclusion to take away is that these products can be a valuable and an interesting option for the building market.

Reference

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