Utilization of waste mineral fibers for the production of composite materials

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In the construction industry, mineral fibers in the form of a reinforced layer of different thickness are often used for the purpose of thermal and acoustic insulation. At the construction site, these prepared layers are then modified into the desired shape, creating waste that must be landfilled. This waste material can be used as a basic raw material for the production of composite materials.

Customer demands for physical, chemical and heat-resistant technical materials are constantly increasing, so it is necessary to pay attention to this area as well. A large part of this area can be satisfied by mineral fibers. Basalt fibers due to their physical, chemical and thermal stability. Basalt fibers surpass glass and asbestos fibers in their properties, which they are beginning to successfully replace. Glass fibers, mainly because of their more affordable price, and asbestos fibers mainly because of their safety, because asbestos fibers are carcinogenic. This study is focused on mineral fibers, i.e. a mixture of basalt and glass fibers.

Samples of composite materials were created, in which the mechanical properties were measured and the internal structure of the composite was monitored (using SEM). The following tests were chosen for testing the mechanical properties: dynamic 3PB using dynamic-mechanical analysis (DMA DX04T), impact strength (Charpy test CHK 50J) and static 3PB (Tiratest 2400).

The actual composite was made up of a matrix (Lukosil M130) and waste mineral fibers from commonly used mineral insulations. The experiment was designed in such a way that the short fiber basalt waste was mixed together with Lukosil M130 as a matrix to form a consistent mixture. 2 types of composite samples were produced. The first type of composite was stuffing the mold with the mixture and curing it in an oven. The second type of composite was stuffing the mold with mixtures and then pressing and at the same time curing on the press.

The measured data were evaluated and the influence of the production technology on the resulting properties of the composite was assessed. The use of the newly obtained composite material is offered especially in the field of insulating materials. Another possible use is, due to their good dynamic-mechanical properties and low specific weight, in the field of construction for the creation of structures, etc.

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