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Thesis title: **The use of phase-change materials for concrete care in dry tropical climate**

Summary

The development of our civilisation should take place in such a way that it does not reduce the development potential of future generations. The use of the decreasing resources of our planet, which is accompanied by a constantly growing number of inhabitants, must be done in a sustainable way.

In relation to construction, this means taking into account all the environmental impacts of a construction object on its full life cycle.

Construction uses over 40% of the energy produced and about 50% of the mass of processed materials. It emits about 35% of greenhouse gases. For this reason, the basic requirements of sustainable construction put emphasis not only on load-bearing capacity and stability, fire safety, noise protection or safety of use, but also on the importance of health and the environment, energy savings and heat protection, as well as the sustainable use of natural resources. In the era of growing global demand for energy, more stringent requirements of modern construction, restrictive standards and growing energy prices, energy-saving and ecological solutions are sought.

The paper attempts to discuss the implementation of intelligent phase-change materials (PCM - Phase Change Materials) added to the concrete mix in hot and dry climate conditions. Therefore, the aspect of analysis of concrete care options in Syrian conditions (hot and dry climate, in which a significant threat is posed by the disruption of the construction of the correct concrete structure due to the significant dynamics of heat release in the curing concrete) was chosen as the subject of research.

These adverse effects can be reduced by introducing appropriate care methods such as adding the PCM mix for the specific use of concrete in the implementation of irrigation systems of highways, large-scale landfills, airports, etc.

The dissertation is experimental and consists in the modelling of daily fluctuations in ambient temperature for Syrian climate in specialized climate chambers and the assessment of the thermal response of young concrete maturing in these conditions. The addition of phase-change materials to a fresh mixture causes thermoregulation phenomena.

PCM perform the following role in the initial phase of concrete maturation:

- they absorb the heat of hydration in the maturing concrete mixture so as to prevent the occurrence of too high a thermal peak and exceeding the allowable thermal gradients inside the mixture,
- improve heat exchange with the environment, gradually giving up heat to the environment during nighttime temperature reduction,
- homogenise the temperature in the entire volume of the concrete mix,
- allow to control the temperature inside buildings.

Regardless of the scientific and cognitive aspects, application effects are also important: the elimination of scratches and cracks in the initial period of concrete maturation, the extension of the durability of the structure, and thus the reduction of the use of natural raw materials for the erection of subsequent objects or structures should not, according to the third principle of sustainable development, deprive future generations of the chance for development.

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