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Construction materials for the protection against severe climatic conditions

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ABSTRACT

The current thesis investigates the use of building materials in construction and in particular in case studies concerning constructions in severe climatic conditions. Initially, a reference to used, existing materials (categories, types and properties) is conducted. Then, the research is focused on smart materials, augmented materials and nano-materials. The purpose of the study is to demonstrate the positive impact of technology, especially nanotechnology to the use of new materials that have improved properties. The positive impact does concern not only the improved material properties (mechanical and others) but also the efficient and effective use of materials in the service of the architectural concept and construction, the achievement of sustainability, the development of environmentally friendly construction and the extension and the enhancement of the construction materials' life cycle.

Two cases are studied. The first case involves coastal concrete structures, where the use of simple coatings and nanotechnology materials is being compared. The comparison is on the bases of total cost over time and other criteria – a multicriteria analysis is conducted to highlight the most economical and beneficial solution taking into account factors other than cost.

The second case involves testing of nanotechnology coatings on steel bars and comparing its performance with traditional methods.

In conclusion, the study has shown the positive contribution of nanotechnology, while, however, the difficulty of the use of new materials in structures without extensive testing must be stressed out. Economically, it is advantageous to select the smart materials, because they give increased strength and extended life in the construction, relieving from the frequent cost of maintenance. Further research in this area is fundamental in order to improve the reliability of the materials. It is necessary to mention, though, that technology development combined with appropriate management techniques is emerging as a very promising field.

KEYWORDS

Materials, Protection, Corrosion, Nanotechnology