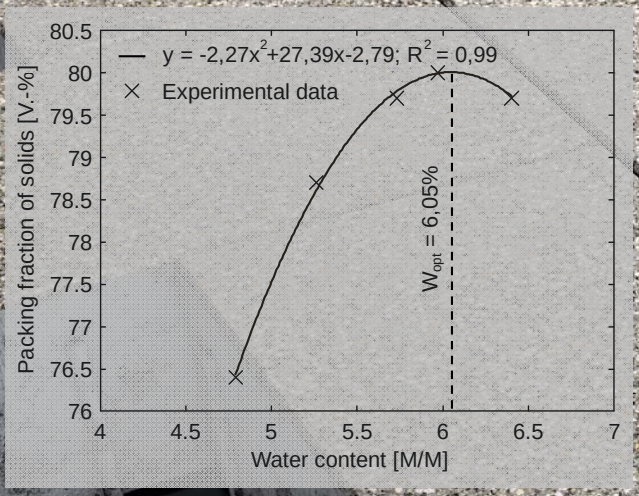
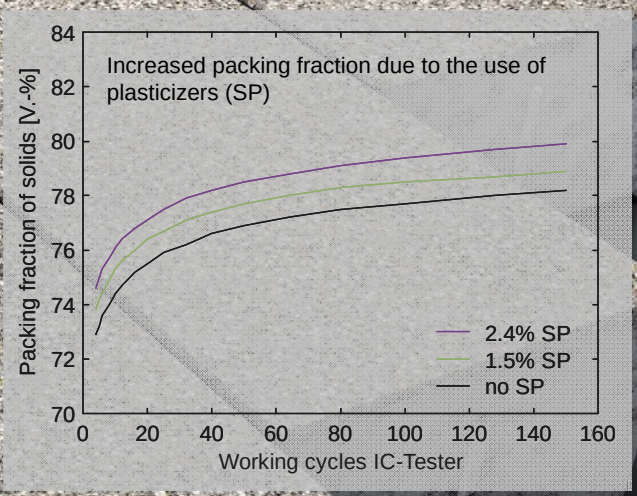
Earth-Moist Concrete

Innovative Solutions

RESEARCH SCHOOL
INTEGRAL DESIGN OF STRUCTURES

Speerpunt BOUW

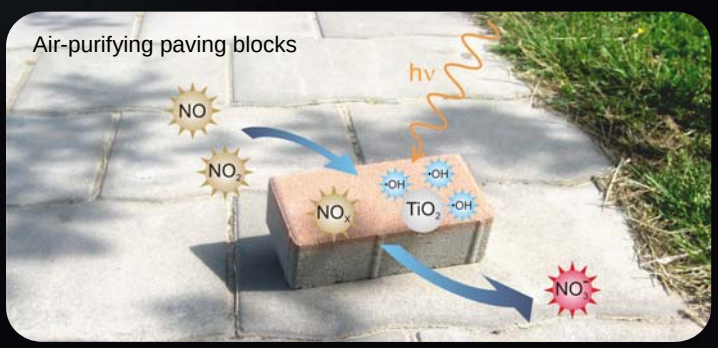




Subject
Concrete is by far the mostly produced man-made material on earth. Concretes having a stiff consistency, so-called zero-slump or earth-moist concretes (EMCs), are used for the production of concrete mass products in particular. These mass products are present in our daily life in all their versatile manifestations such as concrete paving blocks, sewage pipes, or road curbs.

Goal
The research focus on the development of multifunctional concrete products applying a new particle packing model and high-tech materials like TiO_2 as photocatalyst. New insights into the early-age behavior of EMC are obtained by means of an appropriate test method (IC-Test).

Results
Innovative concrete mass products that meet the future demands in sustainability and durability are developed. These products show multifunctional properties for paving and air purification.



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Earth-Moist Concrete – Innovative Solutions

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Subject
The use of natural resources in consideration of ecological and economical aspects forms the foundation for sustainable development. Low energy consumption during production and the use of by-products and waste materials are necessary to avoid environmental as well as financial impacts.

Goals
So far, stone waste materials are not considered as suitable ingredients for concrete production although the use of industrial by-products like fly ash and blast furnace slag is an approved method in concrete production. This research project will show the potential of stone waste materials for the production of concrete mass products made of earth-moist concrete (EMC) and its environmental and financial benefits. For the development of innovative concrete products, stone waste materials will be applied together with photocatalysts (titanium dioxide) to combine sustainable use of primary raw materials and air-purifying abilities in the end product.

Research Question
- Development of a theoretical model for EMC
- Performance based mix design concept for EMC based on particle packing ideas
- Use of stone waste materials in EMC mixes
- Application of photocatalytic materials in concrete mass products (paving blocks) considering new types of titanium dioxide
- Improvement of air-purifying abilities of the functional top layer of paving blocks

Strategy
In the first instance, particle packing ideas will be studied and applied for developing a performance based mix design concept. The new mix design concept forms the foundation for further investigations on EMC. The results of the investigations are used within a theoretical model for EMC.
Furthermore, the mode of action of photocatalytic materials in cementitious materials is investigated. New insights in the working mechanisms of photocatalytic materials in cementitious materials are the starting point for developing new types of functional concrete products. This new type of functional products is using cost-efficient photocatalytic powders to stimulate the use of air-purifying concrete in critical areas.

Expected Results
By means of an optimized particle packing, stone waste materials will be used for the production of earth-moist concrete mixes. These mixes are characterized by low cement contents which will meet mechanical and durability requirements.

Preferred Partners Applications / Sponsors
The research project is sponsored by the integrated project for SMEs (EU 6th FP): “Re-engineering of natural stone production chain through knowledge-based processes, eco innovation and new organizational paradigms” (Acronym: I-STONE) and the user/sponsor group “Cement-Immobilisates-Concrete research”.

Prime Publication
The results of this research project will be published in conference proceedings, scientific journals and a PhD thesis.

Research Period
2005 - 2009