Development of Eco Autoclaved Aerated Concrete

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Introduction

Autoclaved aerated concrete (AAC) is a well-known and low energy construction material. It combines isolating and loadbearing properties, fire resistance, light weight, good workability and eco-friendliness.
In ordinary cement and concrete application plenty of different raw materials and puzzolanic replacement materials are known. In contrast, in AAC only limited changes in composition are applicable without huge research effort.
In the present research project different replacement material will be investigated that are either everywhere and commonly available or industrial by products with an undiscovered potential. The preliminary study from /1/ will be continued. Scientific information about the reactions and the material behaviour before the autoclaving are rarely available (/2/, /3/, /4/). Up to now the prediction of the influence of a new material is not possible. This research shall explore not only on the influence of the raw material to the final product, but also the influence and relation to the intermediates (fresh properties) shall be investigated. Finally, optimizations and developments from other fields of construction materials, such as improved particle packing and mix design /5/, will be implemented.

Materials and methodology

The research is based on a special AAC-recipe, developed for lab scale approaches. During the research the partly or fully replacement by several natural materials and industrial by-products shall be tested. Requirements for these materials are availability, chemical and phase composition, other (industrial) applications, costs and, equally important, environmental footprint. Suitable materials are recycling wastes, landfill materials, diverse natural and artificial ashes, and already mined natural rocks.
The first part of the project deals with the selection of suitable materials and their characterization. Together with the study of fresh property behaviour (slurry, greenbody) first insights will be obtained.

As far as known, there are no standard tests or requirements for the slurry and the greenbody available. Commonly used tests of cement and gypsum slurries shall be adapted to describe the relationship between the diverse parameters (for example slump flow, water demand, stiffening by penetration).
The most promising compositions will be tested in a lab-scale autoclave, that is specifically designed for AAC production under industrial-near conditions.
A simplified flow-chart of this research is given in Fig. 1.
The materials (from raw materials to the final AAC) will be characterized and tested by different techniques, e.g. XRD, XRF, PSD, SEM, TG/DTA, strength tests, density tests, specific surface area, pore size distribution and others, depending on specific questions.

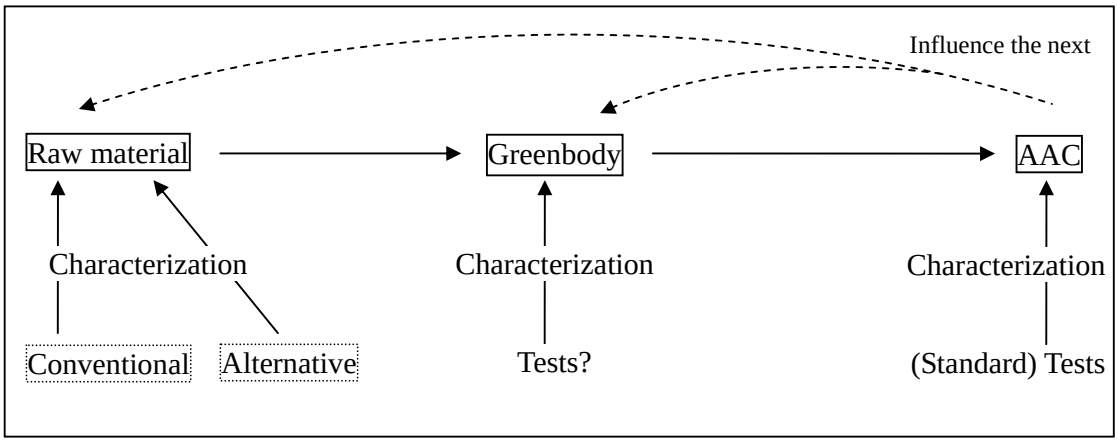

Fig. 1: simplified flow-chart of the AAC production process, the materials and relations between them and the gained data.

Acknowledgement

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