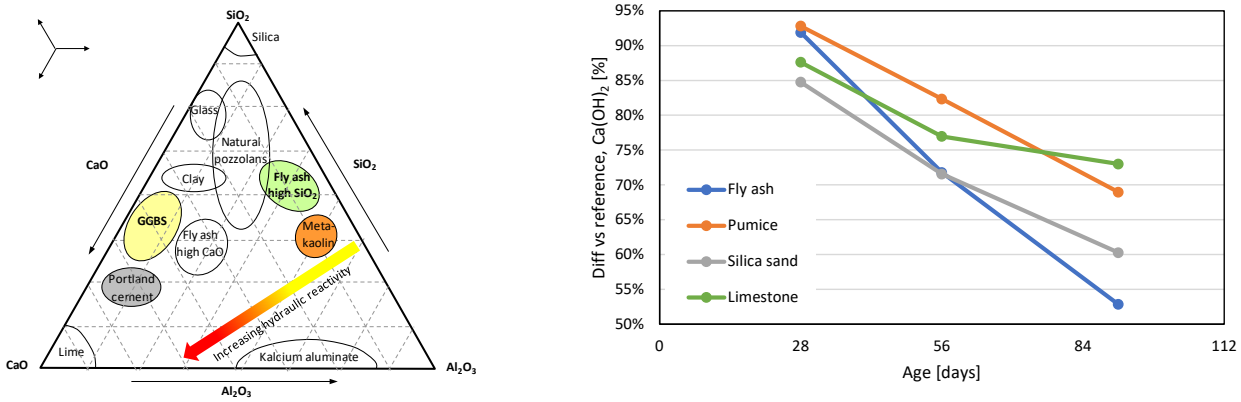
Pozzolanic reaction of alternative SCMs

Master's project for the Master Program Structural Engineering and Building Technology

Background

The use of supplementary cementitious materials (see Figure 1) is increasing due to a number of reasons such as reduced environmental impact. The supplementary cementitious materials cause a change in the hydration, the hydrates formed and in the pozzolanic reaction when calcium hydroxide is consumed (see Figure 1(b)). For new types of supplementary cementitious materials (SCMs) it is important to understand how they react and if they are pozzolanic or latent hydraulic binders. In EN 196-5 [5] a method for assessing pozzolanicity is described (also known as the Frattini test). However, this test is rather poor at distinguishing and rating pozzolanic materials used with cement as the pore solution is different compared to the test, having more alkalis and a higher pH. Hence, other test methods, such as TGA (thermo gravimetric analysis) and XRD are required for assessing the reactions.



(a) *(b)*

Figure 1. (a) Chemical composition (main components) of different binders. (b) Development and consumption of calcium hydroxide during hydration.

Purpose/Method

This master thesis proposal aims to investigate new types of SCMs (e.g., ground pumice, alternative ashes, treated sewage sludge ash, etc.). Experiments will be conducted were both the strength development (EN 196-1) as well as the hydration is characterized by conducting XRD and TGA analyses.

Impact

A better understanding of hydration of new types of supplementary cementitious materials and how they influence hydration. This is a direct response to the growing need for material specialists who understand hydration of cementitious materials and with hydration modelling capabilities.

Thesis setup information

The master thesis will be carried out at Thomas Concrete Group in collaboration with Chalmers University of Technology. This Master Thesis work will be part of an ongoing project and is suitable for students interested in concrete technology, experimental work and theoretical modelling.

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