CO_2CONCAP – CO_2 capture by cementitious materials in the fresh state. Influencing factors and numerical model

Summary

Concrete is the material most widely used in the construction industry. Its production process is responsible for a significant amount of CO_2 emissions, mainly because of cement manufacture, which is estimated to be responsible for 5% to 7% of the global CO2 emissions. Even though concrete structures can absorb some CO_2 during their life cycle, only 8% to 28% of the reactive materials are estimated to be carbonated in the end of that period.

The aim of this research is to reduce the environmental impact of the concrete industry through the uptake of CO_2 during the concrete production phase, which would enable its application in the ready-mix concrete industry.

However, the few research works on this issue report contradictory results regarding the impact of CO_2 when added during the mixing phase, as they either an increase or a decrease in the amount of hydration products, depending on the CO_2 amount.

Thus, this research aims at understanding the impact of CO_2 amount on the hydration reactions of cement in order to enable its adoption as a component mixture.

To achieve this purpose, 4 cement pastes were produced with different amounts of CO_2. Compressive strength, SEM, XRD analysis and pH measurements were performed to assess the influence on the hydration reactions and also on the degree of carbonation. Results suggest that there is a maximum amount of CO_2 that can be added to the mixture above which the properties of the cementitious material may be compromised.

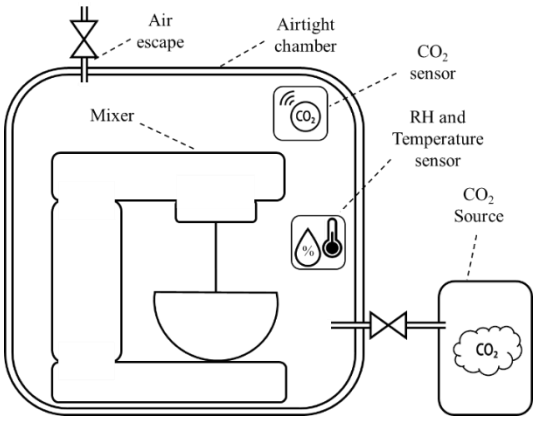

Figure 1. Carbonation during mixture equipment setup.

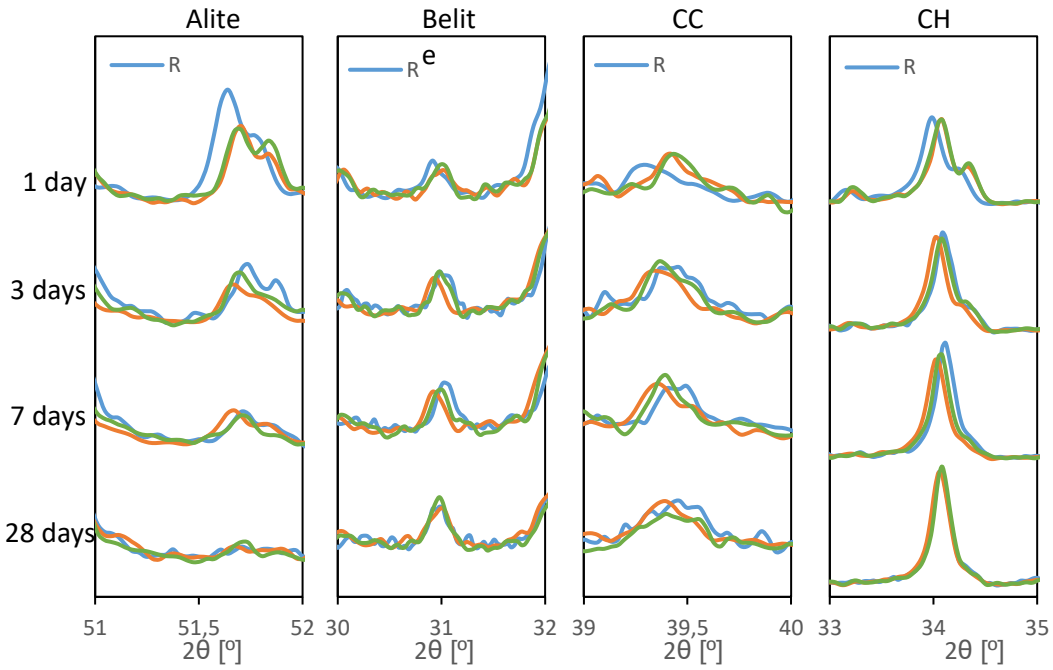

Figure 2. XRD patterns for alite, belite, CC e CH.

Project Reference

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