

The influence of different drying techniques on the water sorption properties of cement-based materials

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Abstract

Dynamic water vapor sorption (DVS) may be used to characterize the pore structure of cementitious materials, but the technique is difficult to interpret as the microstructure is very sensitive to drying and rehydration due to humidity exposure. The removal of interlayer water or chemically bound water can cause microstructural shrinkage. As all drying techniques more or less dehydrate C–S–H and ettringite, they cause a restructuring of the C-S-H.

In the present paper, DVS measurements were performed to characterize the changes induced by different drying techniques in the textural and sorption properties of the material, while thermogravimetric analysis was used to elucidate carbonation.

The ideal drying technique, which can preserve the microstructure and can remove only the non-bound water, does unfortunately not exist. All drying techniques separately affect the microstructure to some extent. However, these changes are minimized when using vacuum-drying and the solvent-exchange-method with isopropanol as drying techniques.

Keywords: Drying, Calcium–Silicate–Hydrate (C–S–H), Microstructure, Adsorption (water sorption), Carbonation.