Determination of hygrothermal properties of cementitious mortar: The effect of partial replacement of cement by incinerated sewage sludge ash

Two sewage sludge ashes were used as substitutes for cement and their effect on the hygrothermal properties of mortar was examined. Different cement to ash ratios and two ash pre-treatment methods (water washing and grinding) were in focus. The impact of cement replacement by sewage sludge ashes on thermal conductivity, sorption isotherms, water vapour permeability, and carbonation was described with standard cement-based mortar as the reference material. Measurement results showed that thermal conductivity decreased by 15% when 30% of the cement was replaced by sewage sludge ash. Water vapour permeability increased as the cement to ash ratio was reduced. Sorption tests were performed by two methods: although differences in the sorption isotherms of mortars were reported when a climatic chamber method was applied, no differences, or only minor differences, were observed with the desiccator method. Measurements revealed that cement-based mortar possessed a higher content of carbonate than cement-ash-based mortar, and it thus appears that the carbonation rate was higher when the cement content was high.

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