Data in Brief 21 (2018) 8–12

Contents lists available at ScienceDirect

Data in Brief

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Data Article

Data of embedded humidity sensors, sample weights, and measured pore volume distribution for eight screed types

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ARTICLE INFO

Article history:
Received 11 May 2018
Received in revised form
5 September 2018
Accepted 7 September 2018
Available online 12 September 2018

ABSTRACT

Four cement-based and four calcium-sulphate-based screed types are investigated. The samples have a diameter of 300 mm and a height of 35 or 70 mm. Up to ten humidity sensors are embedded directly during the concreting of the screed samples. Thus, the humidity over the sample height is monitored during hardening, hydration, evaporation, and oven drying. Furthermore, the screed samples are weighed during every measurement to determine the total mass and the corresponding moisture loss.

To define the pore system precisely, mercury intrusion porosimetry as well as gas adsorption is performed. According to the data, the entire pore volume distribution is known. The measured pore diameters range from 0.8 nm to 100 μm and the total porosity of the examined screeds ranges between 11% and 22%.

Based on these measurement data, moisture transport, pore saturation as well as sorption isotherms and their hysteresis may be calculated quantitatively as described in "Monitoring of the absolute water content in porous materials based on embedded humidity sensors" (Strangfeld and Kruschwitz, 1921).

DOI of original article: https://doi.org/10.1016/j.conbuildmat.2018.05.044
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https://doi.org/10.1016/j.dib.2018.09.020

Specifications table

Subject area	Materials science
More specific subject area	Non-destructive testing in civil engineering
Type of data	Figures
How data was acquired	Capacitive humidity sensors, mercury intrusion porosimetry (MIP), gas sorption, high precision balance
Data format	raw and processed
Experimental factors	Output voltage of the capacitive humidity sensors is converted to relative humidity based on the equation described in the data sheet, pressure steps of MIP are converted to pore radii based on the Washburn equation, pressure steps of gas sorption are converted to pore radii based on the BJH theory
Experimental features	Humidity sensors are embedded directly into screed to monitor material humidity and material moisture
Data source location	Climate chamber at Bundesanstalt für Materialforschung und -prüfung, Unter den Eichen 87, 12205 Berlin, Germany
Data accessibility	Data is available with this article and at http://researchdata.4tu.nl/home/ DOI: 10.4121/uuid:d2ba436f-78c0–4105-8a1f-5422fcb37851 URL: https://data.4tu.nl/repository/uuid:d2ba436f-78c0–4105-8a1f-5422fcb37851
Related research article	Strangfeld, C. and Kruschwitz, S, "Monitoring of the absolute water content in porous materials based on embedded humidity sensors", Construction and Building Materials, vol. 177, pp. 511–521, 2018 [7]

Value of the data

- These experimental data might be used to calibrate and validate simulations of moisture transport in porous materials.
- These experimental data of moisture transport in porous materials, including the pore volume distribution, might be used to evaluate and optimize other sorption models.
- These data provide an approach to predict the hysteresis of the sorption isotherm between adsorption and desorption. Other pore geometries and distributions, including tortuosity, might be investigated to describe the hysteresis more precisely.
- These data might help to better understand the shift from convective dominated moisture transport in the pore system at high humidity toward diffusive dominated moisture transport at lower humidity. A linkage of the Navier-Stokes equation to Fick's law would be required.
- The proposed data evaluation might be used to adapt the described theory to other porous materials in physics, chemistry, and engineering.

1. Data

All examined screed samples are listed in the overview (pdf-file). Eight different screed types were investigated, including four cement-based and four calcium-sulphate-based screeds. Each screed type consisted of three test samples. The first two samples of each screed type were equipped with embedded sensors, the third one was investigated destructively. The weight of the screed samples over time is documented. The corresponding data of the embedded humidity and temperature sensors are given. Furthermore, the data of the pore volume distribution of each screed type based on gas sorption and MIP is documented.