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# NUMERICAL MODELING OF SORPTION-DESORPTION FOR POROUS MEDIA THROUGH RANDOM FIELDS

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Water activity in a porous media depends essentially on water content and temperature. The graph representing the variation of water content regarding relative humidity at a given temperature of an equilibrium environment is called an isotherm. Water sorption isotherms are used to characterize the hydraulic behavior of cement based materials. In isothermal conditions, variation of relative humidity is the only factor leading the material to dry. Analyzing water sorption isotherm also allows characterizing the microstructure of the material, including porosity distribution through Kelvin Laplace equation [1].
In cement based materials just as cement paste, there remain generally extremely fine pores, which result in considerable value of pores specific surface. Consequently obtaining isotherms experimentally is considered as a substantially time-consuming experience. Therefore, it is of interest to model the isotherm from a numerical point of view.
In this study, results from an experimental campaign have been considered. A hysteresis is noticeable between two curves of sorption and desorption. Looking closely at the curves, one could note that for a given relative humidity, two different water contents are distinguished. This phenomenon is related to the structure of the porous network. Pores of a certain diameter are not equally accessible. This phenomenon is referred to as ink-bottle effect. It has been shown throughout different researches that it strongly depends on particular details of the pores geometry. This physical phenomenon with such complicated effects makes complications in the modeling of isotherm hysteresis. This has been a field of study of intense researches, however, there are not many models relying on true physical effects which take place during drying and saturation [3].
In the present work, in order to model a porous media, a numerical morphology of the geometry of the porous media has been presented by means of a random field excursion through the selection of a random field and a threshold [2]. Random field parameters are defined based on experimental values. Once the porous media has been reproduced, the

morphological analysis must be done in order to model water transfers.
The Morphological opening has been carried out with different structuring elements due to the existing relationship between the size of structuring elements and the corresponding relative humidity through Kelvin-Laplace equation. Therefore, water content in each relative humidity can be measured by mean of the geodesic reconstruction.
It can be concluded that, applying morphological analysis facilitates to model the physical phenomenon which leads to the ink-bottle and hysteresis effects. Finally, some results on cement paste will be presented.

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