Lattice modelling of the influence of microstructure on the water transport in porous materials

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Abstract

The microstructure of construction materials influences their transport properties, which are closely linked to the durability of these materials. However, for unsaturated conditions, the connection between microstructure and macroscopic transport properties is still not fully understood. The aim of the present work is to improve this understanding by computational modelling. In recent work, a phenomenological lattice model has been developed to analyse absorption of water through concrete [1,2]. In the present work, this lattice approach is extended to the modelling of the microstructure of the material. The pore structure is idealised by a lattice of conduit elements, whereby the diameters of the pipes are chosen to match experimentally obtained pore size distributions. Pipe elements are considered to be filled with either liquid water or vapour. A special solution procedure is developed for this discontinuous constitutive response. The new model will be used to analyse water absorption for different pore size distribution. This will enable retention curves to be predicted for different pore size distributions.

References

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