

The Numerical Homogenization of the Concrete Behavior

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This article presents a numerical method of homogenization for the thermal-hydro-mechanical behavior of heterogeneous materials. We choose a representative volume in which heterogeneities are generated in random process. The numerical model is used to predict elastic behavior as well as thermal damage behavior and the permeability of cement-based materials. This numerical model, named Digital Concrete, is developed and implemented in the general finite element code 'SYMPHONIE'. It is used then to the calculation of the High Strength Concrete homogenized behavior. Obtained results appear in good agreement with experimental measures. They show the capacity of the model to take in account the effect of the size distribution of aggregates and pores of concrete. Furthermore, this method allows through the process of localization to estimate the local fields and to predict possible damages of the material under thermal loads.

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